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ADVANCED DEVELOPMENT OF A PARACHUTE
RETROCKET AIRDROP SYSTEM

George Chakoian

Army Natick Laboratories
Natick, Massachusetts

May 1973

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TECHNICAL REPORT

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ADVANCED DEVELOPMENT OF A
PARACHUTE RETROCKET AIRDROP SYSTEM

by

George Chakoian

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13. ABSTRACT <p>This report proposes a plan for Advanced Development of a Parachute Retrorocket Airdrop System for the airdrop of cargo loads weighing from 2500 to 40,000 pounds from altitudes of 500 feet or less above terrain.</p> <p>The Parachute Retrorocket Airdrop System concept uses relatively small fast opening parachutes for stabilization and preliminary retardation in combination with rockets for final descent velocity control just prior to impact.</p> <p>This capability is required by the US Army to increase delivery accuracy and to provide greater protection to the aircraft by decreasing its detection to hostile radar and fire.</p> <p>The objectives of this plan for Advanced Development consist of detailed functional, economic and operational analyses of the system, Advanced Development hardware design, fabrication and flight testing.</p> <p>The Parachute Retrorocket Airdrop System is an extremely versatile concept. In addition to airdropping at low altitude, later generations of this concept could be used to:</p> <ol style="list-style-type: none">Airdrop supplies and equipment from medium and high altitudes with high accuracy.Airdrop special and fragile loads that impact at very low velocities.Airdrop all loads with near zero impact velocities so that no energy dissipator is required.		

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Details of illustrations in
this document may be better
studied on microfiche

Airdrop Engineering Laboratory
US ARMY NATICK LABORATORIES
Natick, Massachusetts

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FOREWORD

This Plan for Advanced Development of a Parachute Retrorocket Airdrop System was prepared during the period November 1971 through February 1972 as the initial effort for a Department of the Army Technical Project No. 1F163209DB33-04 and task titled Advanced Development of Airdrop Systems.

The above work was preceded by the satisfactory completion of both a preliminary and an in-depth Exploratory Development investigation of Low Altitude Airdrop Systems for Supplies and Equipment.

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ABSTRACT

This report proposes a plan for Advanced Development of a Parachute Retrorocket Airdrop System for the airdrop of cargo loads weighing from 2500 to 40,000 pounds from altitudes of 500 feet or less above terrain.

The Parachute Retrorocket Airdrop System concept uses relatively small fast opening parachutes for stabilization and preliminary retardation in combination with rockets for final descent velocity control just prior to impact.

This capability is required by the US Army to increase delivery accuracy and to provide greater protection to the aircraft, decreasing its detection to hostile radar and fire.

The objectives of this plan for Advanced Development consist of detailed functional, economic and operational analyses of the system, Advanced Development hardware design, fabrication and flight testing.

The Parachute Retrorocket Airdrop System is an extremely versatile concept. In addition to airdropping at low altitude, later generations of this concept could be used to:

- a. Airdrop supplies and equipment from medium and high altitudes with high accuracy.
- b. Airdrop special and fragile loads that impact at very low velocities.
- c. Airdrop all loads with near zero impact velocities so that no energy dissipator is required.

1. Introduction

The Parachute Retrorocket Airdrop System (PRADS) was developed to meet the US Army Qualitative Material Requirement (QMR) for an Airdrop System for Supplies and Equipment at Low Altitudes.

The QMR Statement of Requirement is as follows:

An air delivery system that will permit delivery of equipment and supply loads weighing up to 35,000 pounds direct from aircraft flying below 500 feet. This system will be used in cargo aircraft to provide air delivery to ground combat units after tactical conditions. Delivery will be possible with greatly improved accuracy and the need for large drop zones will be reduced.

The PRADS' concept uses relatively small fast opening parachutes for stabilization and preliminary retardation in combination with rockets for final descent velocity control just prior to impact.

PRADS' greater accuracy is achieved because of its smaller parachute size which subjects the load to wind drift for a much shorter period of time when dropped from any given altitude.

2. Preliminary Exploratory Development Program

During a preliminary exploratory development program, proposals were solicited from industry for new concepts to airdrop loads from low altitude. Twenty-five proposals were received; some of which included similar concepts. The best proposal for each concept was selected and separate contracts were awarded for study. These included:

- a. Retardation by Aircraft Kinetic Energy
- b. Parachute Reel In/Reel Out
- c. Rotating Decelerators
- d. Ground Slide
- e. Parachute Inflation Aids
- f. Extraction by Recovery Parachutes
- g. Parachute Retrorocket Deceleration
- h. Elevation of Recovery Parachutes
- i. Lifting of Aerodynamic Decelerators



FIGURE 1 PRADS SEQUENCE OF OPERATIONS

Upon completion of a nine month study contract, a detailed evaluation of the results concluded that two of the concepts warranted further study. One concept was PRADS and the second concept was a combination of Parachute Inflation Aids and Extraction by Recovery Parachute called Extraction by Inflation Aided Recovery Parachutes (EXIARP).

3. In-Depth Exploratory Development Program

Two separate In-Depth Exploratory Development contracts were awarded, one for the additional study of PRADS and one for EXIARP. The objective of this program was to extend, by actual demonstration, the maximum load weight airdropped to 35,000 pounds from an altitude of 500 feet above the terrain and to develop a prototype design as a result of testing, study and analysis.

A total of 39 EXIARP tests with loads weighing up to 23,550 pounds were conducted.

A potential flight safety hazard terminated the EXIARP test phase.

A total of 34 PRADS tests with loads weighing up to 35,000 pounds were conducted.

See Figure 1 for PRADS Sequence of Operations.

A technical evaluation of the two concepts resulted in the conclusion that PRADS meets all of the pertinent Qualitative Material Requirements and has the greatest military potential. Also, PRADS can be used economically and reliably to airdrop loads weighing up to 35,000 pounds from altitudes up to 500 feet above the terrain.

The Preliminary and In-Depth Exploratory Development programs provided the state-of-the-art and technological base for the development of a low altitude airdrop system, the evaluation of the feasibility and practicability of many proposed solutions, and the determination of their parameters. The next logical effort in the research and development cycle is the Advanced Development of PRADS.

4. Conclusions of Exploratory Development Program

The major conclusions reached after a review of all the studies and test results show that:

- a. PRADS is the first significant major improvement in the airdrop field since the use of parachutes was initiated.
- b. PRADS is the only system out of the 25 proposals received during the Preliminary Exploratory Development investigation to survive the subsequent In-Depth Exploratory

Development investigation and meet by actual demonstration the US Army requirements for a Low Altitude Airdrop System for Supplies and Equipment.

c. PRADS is capable of delivering loads weighing up to 35,000 pounds from altitudes up to 500 feet above the terrain.

d. PRADS airdrops improve accuracy and reduce detection to hostile radar and fire.

e. PRADS cost under combat conditions is comparable to or slightly higher than, the existing system. PRADS cost under non-combat conditions is appreciably higher than the existing system. It is possible that a training system can be developed to reduce PRADS cost under non-combat conditions.

f. PRADS cost can also be reduced by:

(1) Optimizing the parachute size for use without rocket motors at as high a load weight as possible that would achieve the minimum altitude requirements.

(2) Compromising to gain the benefits obtainable by a decrease in the maximum load weight and/or an increase in the minimum drop altitude.

g. PRADS weight is less than existing system for the range of loads where rockets are used.

h. PRADS capability can be extended to 50,000 pound loads.

i. PRADS reliability can be equal to or better than the existing system.

j. PRADS is an extremely versatile concept. In addition to airdropping at low altitude, later generations of this concept could be used to:

(1) airdrop supplies and equipment from medium and high altitudes with high accuracy.

(2) airdrop special and fragile loads that impact at low velocities.

(3) airdrop all loads with near zero impact velocities so that no energy dissipator is required.

5. Advanced Development

Advanced Development is required to design, fabricate, and test prototype equipment and techniques to demonstrate the technical feasibility of a proposed solution for experimental or operational test prior to Engineering Development when equipment and techniques are developed for military service use.

Adequate preliminary design and testing of PRADS has been accomplished during the Preliminary and In-Depth Exploratory investigations to ascertain that this is the best concept that can be developed by accepted design techniques without requiring any technological breakthroughs.

The objectives of PRADS Advanced Development consist of detailed functional, economic and operational analyses of the system, Advanced Development hardware design, fabrication and flight testing to determine the degree of conformity to the goals, requirements and characteristics of a low altitude system design.

The specific goals of PRADS Advanced Development include:

- a. Initial Engineering Design of an optimum parachute size for use without rocket motors for the lighter weight loads and with rocket motors for the heavier loads in order to achieve the minimum altitude requirements while maintaining the lowest system operating cost.
- b. Initial Engineering Design of a new single rocket pack.
- c. Initial Engineering Design of a new larger size rocket motor.
- d. Initial Engineering Design of a new optical ground sensor.
- e. Clarification of cost, operational and technological factors.
- f. Flight Safety tests of the Advanced Development model.
- g. Airdrop tests of the Advanced Development model.
- h. Investigation of associated problems.

6. Recommendations

It is strongly recommended that PRADS development be continued under an Advanced Development program in accordance with the plans outlined in Appendices 1 thru 5 as listed below.

The effort in Appendices 1, 2 and 3 can most appropriately be accomplished by a systems contractor.

The effort in Appendices 4 and 5 can most appropriately be accomplished by the lead government laboratory specializing in its particular field as noted below.

- Appendix 1: Statement of Work for the Advanced Development of a Low Altitude Airdrop System for Supplies and Equipment using PRADS
- Appendix 2: Data Items
- Appendix 3: Contract Data Requirements List
- Appendix 4: Procurement/Work Directive to Harry Diamond Laboratories for Development of a Ground Sensor
- Appendix 5: Procurement/Work Directive to Frankford Arsenal for Development of a Rocket Motor.

Flight safety tests and airdrop tests of the Advanced Development model can be conducted by 6511th Parachute Test Group at El Centro, CA.

Appendix 1

**Statement of Work for the Advanced Development of a Low
Altitude Airdrop System for Supplies and Equipment using PRADS**

Statement of Work for the Advanced Development of a Low Altitude Airdrop System for Supplies and Equipment Using the Parachute Retrorocket Airdrop System

Scope: The purpose of this contract is to conduct an Advanced Development Investigation of a Low Altitude Airdrop System for Supplies and Equipment employing a combination of parachutes and retrorockets, hereafter call Parachute Retrorocket Airdrop System (PRADS).

The contractor shall for a period not to exceed 18 months from the effective date of this contract, furnish the necessary labor, materials and facilities incident to and necessary to optimize, validate or redesign and test the PRADS model developed during a recently completed In-Depth Exploratory Development Investigation of PRADS under contract DAAG17-68-C-0019.

1.0 Introduction:

1.1 Requirement: Low altitude airdrop of supplies and equipment from a nominal altitude under 500 feet is desirable due to the increased vulnerability of aircraft to detection by radar and hostile fire at the current airdrop altitudes. There is a need for a new or improved airdrop system to overcome known or anticipated threats to take advantage of advanced airdrop technology and to increase accuracy.

1.1.1 Purpose: A primary function of airdrop in the US Army mission is surprise assault by aircraft. The requirement for surprise dictates minimum reliance on drop zone improvement. The requirement for mass transport demands airdrop system reliability, simplicity and economy. The ideal airdrop system could, therefore, be defined as that system which realizes the advantages of low altitude airdrop with minimum compromise of the above requirements.

1.1.2 Plan: This procurement is for the Advanced Development Investigation of a Low Altitude Airdrop System for Supplies and Equipment. Advanced Development is usually performed to meet a Department of the Army statement of military need for the development of new material which requires development of hardware for experimentation or test to clarify technological, cost and/or operational factors prior to beginning Engineering Development for military use. The PRADS concept was selected for Advanced Development by the US Army Natick Laboratories (USANLABS) as the most promising of nine concepts studied for further development. The selection was made based upon qualitative technical analysis and test summaries accomplished by system contractors under contract DAAG17-68-C-0019.

1.1.3 Objectives: The In-Depth Exploratory Development of PRADS which was completed during FY71, demonstrated the feasibility of a new concept by actually airdropping loads weighing from 3000 to 35,000 pounds from low altitudes. The main objective of this Advanced Development phase is to initiate Engineering Design, study and test the PRADS Advanced Development model for the airdrop of supplies and equipment weighing from 2500 to 40,000 lbs. from altitudes not exceeding 600 feet, with a target of 500 feet maximum altitude that includes 50 feet for aircraft error. It is expected that the lower weight loads will be airdropped from the lower altitudes and the higher weight loads will be airdropped at altitudes determined from cost vs. altitude trade-off studies. To achieve this objective the following major tasks must be accomplished.

1.1.3.1 Initial Engineering Design of an optimum parachute size for use without rocket motors with the lighter weight loads and with rocket motors with the heavier loads in order to achieve the minimum altitude requirements while maintaining the lowest system operating cost.

1.1.3.2 Initial Engineering Design of a new single rocket pack.

1.1.3.3 Clarification of cost, operational and technological factors.

1.1.3.4 Flight Safety tests of the Advance Development model at El Centro, California.

1.1.3.5 Airdrop tests of the Advance Development model.

1.1.3.6 Investigation of associated problems.

1.1.4 Supporting Government Laboratories and Arsenals: Throughout this Advanced Development phase, USANLABS will be supported by other Government activities. USANLABS has awarded a procurement/work directive to Harry Diamond Laboratories for the responsibility of developing the ground sensor and for providing the test quantities needed by the system contractor as Government furnished equipment. USANLABS has also awarded a procurement/work directive to Frankford Arsenal for the responsibility of developing the rocket motor and for providing the test quantities needed by the systems contractor as Government furnished equipment. The contractor is advised that the supporting Government activities will require access to all of the information that will be developed under this contract. The contractor specifically agrees that he will furnish all such information that may be called for by the USANLABS, in order that the supporting Government Laboratory or Arsenal may properly develop his responsible portion of the Advanced Development phase as spelled out in their respective assigned Procurement/Work Directives. The contractor will be furnished data he may require which are developed by the supporting Government activities.

1.1.4.1 Direct contact by the contractor with the supporting Government Laboratory and Arsenal is authorized and encouraged.

1.1.4.2 The contractor shall provide the performance requirements of PRADS and its components and also shall provide design guidance to the Government activities supporting USANLABS.

1.1.4.3 The choice of and design of the rocket motor shall be the responsibility of Frankford Arsenal. The choice of and design of the ground sensor shall be the responsibility of Harry Diamond Laboratories. However, the design of these components shall be coordinated by the particular supporting Government activity with the contractor.

1.1.4.4 Design sketches or drawings of all Advance Development components of the rocket motor and ground sensor and a description of how each operates as well as the preliminary prototype drawings of these components will be submitted to the contractor by the responsible supporting Government activity for written approval of its application to validate form, fit and function with PRADS before they are finalized. Copies of all information sent by the contractor to Frankford Arsenal and Harry Diamond Labs will be furnished to the Natick Laboratories Project Officer.

1.1.4.5 It is imperative that close coordination between the contractor and government activities be maintained at all times. Frequent communication by telephone, telegram and informational letters is encouraged. The success of this program is highly dependent on smooth-flowing passage of information between the parties.

2.0 Final Engineering Design Airdrop System Performance Requirements:

2.1 Performance Characteristics:

2.1.1 The airdrop system shall be capable of airdropping supplies and equipment in serviceable condition to ground combat units in tactical situations from standard and developmental USAF airlift cargo aircraft under the following conditions:

2.1.1.1 At the minimum feasible altitude above the terrain which does not exceed an altitude of 600 feet for loads weighing from 2500 to 40,000 lbs.

2.1.1.2 System and/or equipment shall be operable within the range of aircraft airdrop speeds from 130 to 150 knots indicated air speed (KIAS).

2.1.1.3 In ground winds with velocities from zero to maximum of 15 knots.

2.1.2 The system must be capable of achieving a mission reliability (delivery of a serviceable load) of .95 and must also provide a probability of .95 of landing within 100 meters of selected impact points without the use of a ground based guidance system. These values assume no aircraft navigation errors.

2.1.3 The system shall be capable of mass aircraft formation airdrop of supplies and equipment in a single load capability of 40,000 pounds per aircraft and multiple load capability up to the capacity of the aircraft and shall be suitable for use on nominal size drop zones. The following extracts from "Drop Zone Size Criteria" as prescribed in FM 57-1/AFM 2-51 are included here for convenient reference.

2.1.3.1 Drop Zone (DZ) Size Criteria. The following safe DZ sizes apply to operations in which equipment is dropped. These criteria and examples provide approximate guides for planning.

2.1.3.1.1 Equipment for single aircraft. The safe-size DZ for one heavy equipment platform dropped from a single aircraft is 600 yards wide x 1000 yards long (550 x 915 meters). For each additional platform add 400 yards (365 meters) to the required DZ length.

2.1.3.1.2 Equipment from an element or larger formation. For a drop from an element or larger formation, the DZ width is increased 100 yards to 700 x 1000 yards (640 x 915 meters) for one platform from each airplane. For each additional platform in any one of the aircraft, add 400 yards to the DZ length required for a single aircraft drop.

2.1.4 The system shall facilitate simple and rapid rigging and derigging of loads by troops and without reliance on materials handling equipment for derigging.

2.1.5 The vertical impact velocity at the drop zone elevation shall not exceed 28.5 feet per second at 5000 feet elevation above sea level and 100°F.

2.1.6 The system shall permit rapid (equal to or better than present system) recovery of supplies and equipment on the ground.

2.1.7 The system shall require no modifications to the standard vehicles or equipment to be airdropped.

2.1.8 The system in normal operation shall not jeopardize flight safety and shall provide for emergency procedures and equipment for counteracting any system malfunction which would jeopardize flight safety. Air Force procedures may be modified to suit, if necessary.

2.1.9 Environmental Considerations. The system shall be suitable for use during adverse weather and night and day operations including climatic categories 1 thru 7 as specified in Table 2-1, AR 70-38. Climatic Category 7 is a desired capability as the maximum level of performance.

2.1.10 The system shall be compatible with the immediate subsequent consecutive delivery of personnel equipped with the developmental low altitude personnel airdrop system.

2.1.11 The system shall not require ground based preparation on or near the drop zone.

2.2 Physical Characteristics:

2.2.1 The quantity, weight and size of the system components shall result in the minimum loss of the cargo carrying capacity of the aircraft in any role.

2.2.2 The system components shall be designed for use with the C-130, C-141 and C-5A USA airlift cargo aircrafts.

2.2.3 System components shall be compatible with standard items to the maximum extent possible.

2.2.4 Components which come into contact with the aircraft skin shall be suitably padded.

2.2.5 The system shall be compatible and comply with the requirements for tiedown suspension and extraction provisions set forth in MIL-STD-814A.

2.2.6 System components shall be capable of withstanding the normal handling incident to shipping and field use.

2.2.7 System components shall be resistant to fungus, mildew, insects and corrosion and employment shall be unaffected by dust, sand, water, wind, mud or snow insofar as possible.

2.2.8 The system shall include no "signature" characteristics which would reveal in advance the nature of the operation to the enemy.

2.2.9 The design of the systems shall be such that visual inspection for operational readiness is possible at time of loading in the aircraft.

2.3 Maintenance Characteristics: The system components shall be designed to facilitate preparation and maintenance by those units whose mission it is to prepare supplies and equipment for airdrop.

2.3.1 The system shall require a minimum number of maintenance manhours.

2.3.2 The system shall make the most cost effective use of expendable components consistent with cost effective principles.

2.3.3 The system shall have maximum interchangeability of components, making use of standard items where practicable.

2.3.4 The system components shall be designed to facilitate assembly and disassembly without the need for special tools.

2.3.5 Maintenance instructions shall be provided for each system component.

2.4 Human Factors Characteristics: The principles of human engineering shall be applied to the design of this system. Consideration should be given, but not limited to, the following:

2.4.1 Human space requirements for ease of operations and maintenance.

2.4.2 That using personnel are exposed to minimum hazards in the preparation and utilization of this system.

2.4.3 Simplification and safety in operation and maintenance.

2.4.4 Operability of the components of the system.

3.0 Airdrop System Design Requirements: The following design requirements must be met by the system being developed.

3.1 General Policy Guidance: General policy guidance for the development and testing of material required to be air transportable or air droppable shall be in accordance with AR 70-39.

3.2 Extraction Provisions: The extraction provisions shall be designed to comply with the requirements of strength, number, location and dimensions prescribed in MIL-STD-814.

3.3 Suspension System: Suspension system shall be designed to provide for attachment of a recovery system to the item of materiel. The system shall be designed to comply with the suspension provision requirements for strength, number, location and dimensions prescribed in MIL-STD-814.

3.4 Restraint Provisions: Restraint provisions shall be designed for the environments prescribed in MIL-STD-814. Present rigging practice for in-flight cargo restraint (e.g., use of textile restraint webbing) should not be changed significantly.

3.5 Safety Factors: The safety factor for all textile components shall be 2.0 ultimate. The safety factor for all metal components shall be as prescribed in MIL-STD-814. These factors shall be applied to the maximum working loads. The yield strength for all metal components shall be at least 90% of the required ultimate strengths.

3.6 Cargo Suspension Fitting Forces: Forces applied to any single cargo suspension fitting shall not exceed 1.5 times the suspended weight. This criterion is based on the usual rectangular arrangement of four suspension fittings on most Army airdrop cargoes.

The system shall not require suspension by more than four points on the airdrop cargo.

3.7 Force Application Points: The system shall apply suspension and extraction forces directly to the Airdrop cargo. The system shall also provide a means for applying extraction and suspension forces directly to the platform for cargoes weighing under 18,000 pounds.

3.8 Cargo Capability: The system shall be usable, within its weight limitations, for the airdrop of all Army materiel which is now airdroppable and as listed on Page 11 thru 18 of Change 1, TM 10-500, Airdrop of Supplies and Equipment Reference Data for Airdrop Loads. Careful attention shall be paid to the effects of the wide variation possible in the size, weight, structure, center of gravity location and platform loading of the rigged materiel.

4.0 Specific Contract Requirements:

4.1 Synopsis of Work and Assumptions: This investigation shall consist of detailed functional, operational and economic analyses of the system; bench and/or scale model tests; and Advanced Development hardware design, fabrication, and flight-testing, to determine the degree of conformity to the goals, requirements and characteristics of a

low altitude system design as herein described. The contractor shall define all areas not specifically covered in this statement of work wherein Advanced Development is required to fully realize the potential performance of the system. Study in these areas also shall be undertaken to achieve this goal. The contractor shall also generate and provide necessary information in a form which will permit evaluation and comparison of this system with the standard airdrop system. Finally, engineering design drawings of the system will be prepared. The contractors shall be guided by the following assumptions, conditions and constraints.

4.1.1 In general, analyses and studies will be performed for operation of the airdrop system from three aircraft, the C-130, C-141 and C-5A. The Advanced Development hardware shall be for use with the C-130 aircraft. There shall be a system design for use with the C-141 and C-5A aircrafts if a different system design is deemed necessary.

4.1.2 The concept of use of the airdrop system will include single cargo airdrop, multiple intermittent cargo airdrop from single aircraft, and multiple consecutive cargo airdrop from mass formations of 30 aircraft.

4.2 Optimize, Validate or Redesign Components: The contractor shall review the existing design and functioning of all system components, especially where deficiencies were discovered during recent analyses and flight tests, such as occurred with the dual rocket pack design. In the case of the ground sensing subsystem and rocket motor, a complete redesign will be conducted by the appropriate Government Laboratory or Arsenal. The design of every Advanced Development hardware component shall be optimized, validated or completely redesigned based on experience, the Airdrop System Performance Requirements in paragraph 2 and the Airdrop Design Requirements in Paragraph 3 in order to achieve a safe and reliable design. Emphasis shall be given to the following.

4.2.1 **Parachute Design Study and Analysis:** Determine the optimum single parachute size and type and also the maximum load weight above the present 8,000 pounds in the no rocket system condition, in order to reduce the overall PRADS cost per drop. Consider the use of, or modification of, existing standard and developmental parachutes.

4.2.2 **Rocket Motor:** Optimize and/or validate the rocket motor performance specifications. This information is required by Frankford Arsenal to develop the rocket motor. The contractor will be responsible for all interfaces with the rocket motor subsystem.

4.2.3 **Ground Sensor:** Optimize and/or validate the ground sensor performance specifications. This information is required by Harry Diamond Laboratories to develop the ground sensor. For engineering information purposes, investigate the merits of a simple adjustment in rocket motor firing heights to achieve lower impact velocities. Determine the additional complexities involved.

4.2.4 Rocket Motor Pack: Optimize and/or validate the rocket motor pack design, including the design of the rocket motor mounting bracket. Integrate the rocket motor pack design with Frankford Arsenal. Include a provision to insure that in case of one rocket motor failure, the remaining rocket motors will not separate from the rocket pack.

4.2.5 Rocket Ignition System Study and Analysis: Optimize, validate or redesign the rocket motor ignition system. The contractor has design responsibility for the rocket ignition system. The contractor will evaluate inputs and recommendations from Frankford Arsenal on their latest rocket ignition methods.

4.2.6 Parachute Riser, Riser Extension and Riser Adapter: Optimize and/or validate the design of these items to prevent failures caused by improper material, size and manufacturing practice. These items must be adequately bench tested prior to flight tests.

4.2.7 Investigate Problem Areas: Investigate problem areas by means of analysis and testing and take corrective measures. Problem areas include, but are not limited to:

4.2.7.1 Evaluation of the need for eliminating sharp ignition peak forces of the rocket motor to alleviate higher than 1.5 G loading on the suspension slings.

4.2.7.2 Determine the impact damage to the rocket pack and load by the falling rocket pack. What critical conditions may cause cargo or rocket pack damage? How can these critical conditions be controlled?

4.2.7.3 Determine the amount of rocket motor flame and hot gas convergence and the resulting burning or scorching of the slings and/or load. Measure temperatures at various places on the load and slings during rocket fire.

4.2.7.4 The possibility and effects of cargo fuel spillage on the platform.

4.2.7.5 The relative importance of all the system related factors in airdrop accuracy and how they are applicable to PRADS.

4.2.7.6 Use of a parachute release mechanism with the no rocket system configuration.

4.2.8 Bench and Scale Model Tests: Performance analyses and design studies shall be supplemented when determined necessary, by breadboard component bench tests, scale model flight tests or vehicle tow tests. The adequacy of the design, the safety, the performance characteristics and the reliability of all components shall be verified to the maximum extent practicable prior to initiation of flight tests at the Government test agency.

4.2.9 Aircraft Safety: A paramount consideration in the operation of the PRADS Advanced Development Model must be aircraft flight safety. Adequate analysis including computer studies shall be performed to establish that no event in the sequence of operation of the system could jeopardize flight safety. Components and their operation shall be designed with fail-safe failure modes. Redundant, easily inspected safeties shall be incorporated to preclude premature or faulty system operation.

4.2.10 Fabrication of Advanced Development Hardware: The contractor shall furnish Advanced Development systems, consumables and spare parts in sufficient quantities to load and conduct 3 airdrop tests from one aircraft at a time because of intermittent availability of the aircraft. Reference paragraph 4.2.11.

4.2.10.1 Fabrication of Demonstration Models: Provide a complete PRADS Advance Development model to NLABS (except for rocket motors and ground sensor) within 180 days upon award of contract. All genuine components are to be used including a rocket pack, parachutes, bags, lines, etc. Also, furnish instructions for assembly and disassembly of the components and furnish special tools. All refinements and modifications of the final model to be incorporated in this model prior to the completion of the contract.

4.2.10.2 Canopy Construction: The parachute canopy(s) shall be constructed in accordance with standard cargo parachute construction practices, as defined in MIL-P-7620B. Every effort shall be made to employ low cost construction and fabrication principles, consistent with required canopy structural strength.

4.2.10.2.1 Canopy Color: The canopy color shall be Olive Green shade No. 106.

4.2.10.2.2 Risers and Riser Extensions: The parachute system shall be provided with appropriate length risers and riser extensions to obtain optimum performance of the parachute cluster. Hardware in the riser and riser extension components of the parachute system shall be kept to a minimum in order to prevent possible interference to orderly and damage-free deployment of the parachute cluster. Whenever possible standard hardware conforming to government specifications shall be used.

4.2.10.3 The contractor shall have no design responsibility for the extraction system. The extraction system utilized shall be an approved standard system.

4.2.10.4 Fabrication of Scale Model: Provide a 1:16 scale model of PRADS within 120 days upon award of contract for display purposes to illustrate the principle of design.

4.2.11 Flight Testing: The contractor shall be responsible for the conduct of a flight test program consisting of approximately:

- a. 45 to 50 drop tests; parachutes only, without rocket motors.
- b. 10 - 12 drop tests, with inert rocket motors.
- c. 30 - 35 drop tests; with live rocket motors.

4.2.11.1 Types of Test:

The above tests will include safety write-off tests, component tests and system tests.

4.2.11.2 System Demonstration: The contractor will conduct a demonstration of the complete system to interested parties invited by USANLABS to view the system in operation. Approximately three or four airdrops will be selected to demonstrate the capacity and performance capabilities of the system. Smaller cargoes may be actual vehicles but larger cargoes shall be ballasted dummy cargoes, including one to demonstrate the maximum capacity of the system. It, however, shall not exceed 40,000 pounds gross rigged weight. Airdrop tests, identical to each system demonstration airdrop, shall previously have been conducted successfully at least twice during the flight test portion of the program. Data may be recorded during the demonstration tests, provided their success is not jeopardized.

4.2.11.3 Government Furnished Support: Support for the standard rigging of loads, loading aircraft, clearing of drop sites, operation of special Government owned instrumentation and incidental support required shall be supplied by the government.

4.2.11.3.1 The following Government instrumentation is available:

- a. Cine-theodolite tracking.
- b. Data transmission and recording by telemetry.
- c. Motion picture coverage including air to air, ground to air and air to ground.

4.2.11.4 Contractor Required Support: The contractor shall provide the necessary engineering and technician support personnel at the test facility to insure that the test program is conducted in an expeditious manner and that valid results are obtained. The contractor shall provide all necessary instrumentation or equipment not available at the test site.

4.2.12 System Performance Envelope: The trajectory and body motions of typical cargoes shall be analyzed to determine the effects of the system operation. As further knowledge of the system is gained from other analyses and test data, the assumptions

shall be modified and the calculations revised. The system performance envelope shall be defined by varying through expected ranges of values the input data such as cargo weight, aircraft velocity and altitude, platform length, initial cargo position in the cargo compartment, opening times for parachutes in clusters, and snatch forces for parachutes in clusters. Estimates of the performance variations of the system shall be made by analysis of individual component performance variations. The dependence on each other between the performance variation of each component and those of other components shall be studied. Inherent constraints may be found which preclude all or most of the components performing unfavorably at the same time. However, a determination shall be made of the system performance degradation which would result from the poor performance of as many of the components as might reasonably be expected to perform at the minimum of their tolerances simultaneously. The results will be correlated with the system flight test data to predict the performance of the eventual system which could be developed.

4.2.13 Operational Utilization Study: Investigate the operational utilization of the PRADS Advanced Development model. Detailed consideration and study shall be given to the use of the eventual airdrop system by Department of Defense personnel both in training and in combat. Each step in the rigging, operation, derigging, recovery, normal refurbishment and repair of the system as well as training and logistic functions shall be examined to determine all possible implications on present operational procedures and vice versa. (For example, if it is determined that a change in military operating procedures to provide a controlled temperature environment prior to use of the rocket motors is not warranted, then the implications on system performance shall be examined and defined. The significant conditions here are the rocket motor environment temperature and time or exposure in storage, in the rigging area, in the aircraft before take off, in the aircraft in flight and above the drop zone and the response rate of the motor to environment temperature changes. For any given mission, the interplay of these factors will affect rocket motor performance and therefore system performance differently. Where the rocket motor internal temperature just prior to firing and the drop zone air temperature are similar, the effects of a high or low temperature are compensated by the changes in the rocket motor thrust and parachute terminal velocity. An increase in the rocket motor temperature increases the rocket motor thrust. An increase in the drop zone air temperature increases the terminal velocity of the parachutes and the resulting increase in the potential impact velocity is compensated by the increased rocket motor thrust. Where rocket motor temperature and drop zone air temperature differ significantly, system performance tends to be degraded. Thus, the concept of use of the system directly affects the performance of the system. The relationship between the system performance and the way it is to be used shall be explored to the greatest extent practicable and trade-offs made accordingly. The need for and extent of operating changes required shall be studied and defined as completely as possible. The fewest possible changes shall be made, and those that are necessary shall be as simple and foolproof as possible.

4.2.14 Economic and Logistics Study: Define the total cost of development, acquisition and operation of PRADS over a period of five to ten years or longer. For comparative purposes, prepare cost data in the form of man hours in addition to dollar values when possible. In establishing the capabilities and the configuration of the airdrop system, the contractor shall maintain a constant awareness of these costs. The greatest emphasis shall be placed to reduce the costs of the final system. Effort shall relate to the total cost of procuring and maintaining a low altitude airdrop capability such that meaningful cost effectiveness values can be forecasted.

4.2.14.1 The advanced Development of this system must be oriented toward simplification of the logistics and reduction of the costs of the final system by applying the following criteria to the final system:

4.2.14.1.1 The heavydrop components and techniques currently in use with the C-130 aircraft shall be retained with minimum modification wherever practical.

4.2.14.1.2 A minimum of special fixtures, adapters, tools or procedures shall be required for monitoring, attaching or securing components to any rigged cargo similar to those commonly required to be airdropped.

4.2.14.1.3 Components shall be designed to be expendable wherever possible, consistent with reliability and cost considerations.

4.2.14.1.4 Components shall be simply assembled and disassembled.

4.2.14.1.5 Components shall require a minimum of preparation before use and a minimum of effort for recovery after use, consistent with normal airdrop procedures.

4.2.14.1.6 Components shall be designed for future economical mass production using commercial techniques and quality of material.

4.2.14.1.7 Components shall be designed for low cost and minimum weight consistent with performance.

4.2.15 Trade-Off Analysis: Select the performance goals of PRADS that require larger order performance improvements considering the requirements of high reliability, safety, weight, cost and other constraints. Study the critical trade-off parameters by conducting a thorough trade-off analysis for the airdrop system. This trade-off analysis shall consider the effect of variations in the detailed parameters of the system on the performance, operational utilization and total cost of acquisition and ownership of the system. These trade-offs shall be identified and the effects of the chosen variations of

the system parameters shall be documented. In general, the system should be configured to: simplify manufacture, support logistics and use of the system, reduce overall costs and enhance operational readiness.

4.2.16 Sensitivity Analysis: The effect of variations on system outputs such as impact velocity and attitude, dispersion, cargo damage and aircraft safety shall be evaluated and minimized by improved design or favorable trade-offs. The following technique for dealing with uncertainties shall be applied where applicable to all of the studies and analyses herein required. This technique consists of attempting to achieve acceptable results throughout a realistic range of values of the uncertainties, rather than attempting to achieve maximum results considering only the most likely value of each uncertainty.

4.2.17 Drop Zone Altitude Effects: The contractor shall conduct a study to determine the effects of drop zone altitude on all aspects of system performance.

Cargo attitude and horizontal and vertical velocities at impact shall be determined for representative cargoes throughout the weight range of the system for drop zone altitudes at 5,000 feet at 41°F, 10,000 feet at 23°F and 15,000 feet at 6°F. Any changes in rigging operational procedures necessary to achieve satisfactory performance shall be enumerated.

5.0 Quality Assurance Provisions:

5.1 Unless otherwise specified in the contract, the contractor is responsible for performance of all inspection requirements as specified herein. Except as otherwise specified, the contractor may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the tests and inspections set forth in the contract when such tests and inspections are deemed necessary to assure that the contractor conforms to prescribed requirements.

5.2 The contractor shall provide and maintain an effective and economical system for inspection, validation and quality control of technical data, planned and developed in conjunction with other contractor functions necessary to satisfy contract requirements. The requirements shall be met by implementation of procedures which insure that only acceptable data are presented to the Government.

5.3 Where the manufacture of hardware is required by the contract, the contractor will certify that all components were manufactured or procured on the basis of the technical data supplied under this system and contract, and that no other technical data, industry or company specifications which do not form a part of the final technical documentation, were used to supplement the technical data during manufacture, purchase or inspection.

This restriction shall not apply to the use of administrative procedure specifications or standard normally used by the contractor in the manufacture or purchase of components; nor is this restriction intended to apply to detail manufacturing data pertaining to "Specification Control" or "Source Control" drawings which have been approved for use.

5.4 The contractor's Technical Data Quality Control System and Technical Data generated by the system shall be subject to evaluation and verification by the Government to determine the effectiveness in supporting the quality requirements in the contract and prescribed herein.

6.0 **Technical Data:** The contractor shall furnish technical data and information in accordance with the requirements, quantities and schedules set forth in the Contractor Data Requirements List (DD Form 1423), and the price for such data will be included in the total price bid or proposed under the contract.

7.0 **Status Meetings/Briefings:** Status meetings/briefings will be held at the contractor's plant, Frankford Arsenal, Harry Diamond Labs, USANLABS, flight test site or other locales as determined appropriate by the USANLABS Project Officer. It is intended, however, that briefings will be held at USANLABS every two months.

7.1 During the conduct of this contract, USANLABS personnel and/or Frankford Arsenal and/or Harry Diamond Labs personnel will visit the contractor's facility to discuss contract progress or specific problems. The contractor will be notified in advance of these visits so that he may formulate an agenda of discussion topics.

8.0 PREPARATION FOR DELIVERY:

8.1 **Packaging.** Each component of the system shall be preserved and packaged in accordance with the applicable requirements of MIL-P-116.

8.2 **Packing.** Components of the system, preserved and packaged as specified in 8.1, shall be packed in a manner to insure carrier acceptance and safe delivery at destination at the lowest transportation rate for such supplies.

8.3 **Marking.** In addition to any special marking required by the contract, interior packages and shipping containers shall be marked in accordance with MIL-STD-129.

9.0 TECHNICAL PROPOSAL:

The contractor shall include the following in his technical proposal:

- a. Proposed Human Factors Engineering Plan (See DI-H-1312)
- b. Proposed System Safety Program Plan (See DI-H-1320A)
- c. Proposed Reliability Program Plan (See DI-R-1730)
- d. Proposed Maintainability Program Plan (See DI-H-1740)

Appendix 2

Data Items

DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)	
	AGENCY	NUMBER
1. TITLE Still Photographic Records	Army	DI-A-1001
3. DESCRIPTION/PURPOSE Still photographic records primarily cover highlights and major events of program development for observation, analysis and evaluation of specific elements and overall of program development and progress. These records provide a pictorial medium for exchange of technical and scientific information and become permanent legal and historic records	4. APPROVAL DATE 15 Dec 69	
	5. OFFICE OF PRIMARY RESPONSIBILITY USAMC	
	6. ODC REQUIRED	
	8. APPROVAL LIMITATION	
7. APPLICATION/INTERRELATIONSHIP DI-A-1000, Photographic Data Plan DI-A-1002, Still Photographic Coverage Report	9. REFERENCES (Mandatory as cited in Block 10) AR 108-5	
	MCSL NUMBER(S) 10012	
10. PREPARATION INSTRUCTIONS <p>1. Still photography will be furnished in 4 x 5 inch black and white original negatives accompanied by two (2) 8 x 20 glossy prints and key subjects will be photographed in color and color transparencies furnished. Color photographs exposed in 4 x 5 size will be made and the original color negatives and two (2) matching 8 x 10 opaque color positives will be furnished.</p> <p>2. Identification data shall be listed in the clear margin in the negative or transparency on the acetate side starting from the left as follows:</p> <ol style="list-style-type: none"> Negative number Contract number, abbreviated Contractor name, abbreviated Last two digits of the calendar year Abbreviated security classification Automatic downgrading authority classification Project name or designation Never letter on exposed picture area 		

DI-A-1001

Preparation Instructions (Continued)

NEVER letter on the exposed picture area. If necessary, prepare and include a title sheet. Negative numbering will begin in sequence starting with the number one (1) at the beginning of each calendar year. The following is a typical negative identification:

(12)	-	1162	-	RAY	-	63	-	SEC	-	III	-	LANCE
(a)		(b)		(c)		(d)		(e)		(f)		(g)

3. Black and white negatives will be placed in individual negative preserver along with complete identifying captioning data. (The same data specified above to identify the film will be placed upon the preserver containing it.) Color materials will be placed in individual protective transparent sleeves and individual negative preservers along with complete captioning data. Captions for still photographic material will meet the test of: Who? What? When? Where? How? and Why?, with explanations for symbols and nick-names. Identify the relationship of the item photographed to the system or subsystem when appropriate.

4. Submittal Schedule. Still photographic inputs will be submitted by registered air mail. Photographs of newsworthy events, accidents, first-time events, program milestones, scientific advancements or breakthroughs, or photographs intended for illustration of priority reports are considered urgent and will be submitted immediately. Bulk shipment of still photographs and/or negative material, other than cited, are to be preferred above random input.

5. Duplicate Materials. Contractors may, at their own expense, make duplicate negatives or transparencies required for their own use when permission is granted by the Contracting Officer.

DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)	
1. TITLE	AGENCY	NUMBER
Motion Picture Film Records 3 DESCRIPTION/PURPOSE Motion Picture Film Records primarily cover specific elements of program development and programs for observation, analysis and evaluation. These records provide a pictorial medium for exchange of technique and scientific information and become permanent legal and historical records.	Army	DI-A-1003
7 APPLICATION INTERRELATIONSHIP DI-A-1000, Photographic Data Plan	4 APPROVAL DATE 15 Dec 69	
	5 OFFICE OF PRIMARY RESPONSIBILITY	
	6 APPROVAL LIMITATION	
	9 REFERENCES (Should be cited in Block 10) AR 108-6 AMCR 108-1	
10 CSL NUMBER(S) 10012		
10. PREPARATION INSTRUCTIONS 1. General Specifications. Each film record will be a complete visual production in 16mm color positive material and will normally contain action, titles and effects, and not exceed twenty minutes screen time in length. However, when deemed essential for clarity, a limited amount of simple animation, art work, graphs, may be used if simple title motion pictures are not sufficient to describe the effort. Optical effects will be limited to the standard 48 frame effects. Film reports will be produced from film master material in camera position made directly from the original footage. All original film is property of the Government and must be forwarded in an uncut state. a. Periodic Film Progress Reports. Produce and furnish periodic film progress reports. Such film reports, when required will depict research and development progress and program status, taking place during the report period. b. Contractor Produced Films. When a contractor produces films other than those specified under the terms of the contract, or those separately negotiated, they will be at no expense to the government and will be made only by permission of the contracting officer. Contractor's film requirements in this category, which will include photography previously costed under the terms of the contract or which will portray equipment, hardware, systems, or activity related to the contract, will first be coordinated with the contracting officer. When such a film is intended for contractor's public relations use, contracting officer approval of the script and production mandatory. The contractor will submit one copy of the film for final approval.		

DI-A-1003

Preparation Instruction (Continued)

c. **Submittal Schedule.** Unless otherwise specified, two composite release prints and two copies of the final cutting of each motion picture periodic film report will be submitted to arrive not later than 30 days following the end of the report period. Preprint materials following matching motion picture rolls will be submitted not later than 30 calendar days following the end of the report period. Delivery of composite prints and preprint materials for special films will be as contractually negotiated.

d. No photographic materials in connection with the contract may be distributed by the contractor without appropriate clearance through the contracting officer. Display of motion picture material to the contractor's internal audiences is limited to those persons with a "need to know".

e. The total film coverage shall be capable of being compiled into a single documentary.

2. **Film Report Title Specifications.**

a. **Title Composition.** Titles will be composed within a standard 10 field frame size and a 2 field allowance will be made around all lettering within the field as a safety precaution.

b. **Background for Titles.**

Background for titles will be composed of appropriate color surfaces over which hot press or script lettered cells are superimposed. Superimposed titles over picture scene(s) may be used when such use will add to the effectiveness of the film production. Color of lettering should deter "bleeding" into picture image.

c. **Lettering for Titles.**

Style (type face) and size of lettering for main title, subtitles, and end title may deviate from standard, if in the opinion of the producing agency, such change is considered essential for more effective presentation.

d. **Classification Titles.**

(1) Classification titles will be used only when the film is for Official Use Only or has a security classification of Confidential, Confidential Restricted Data, Secret, Secret Restricted Data, Top Secret, or Top Secret Restricted Data.

DI-A-1003

Preparation Instruction (Continued)

(2) The appropriate classification group category statement, i.e., automatic timephased downgrading notations and the date of the classification of the film (month and year) will be shown on all classification titles.

e. Leaders.

(1) Each reel will have the film number and title marked on the head and foot of the leaders.

(2) On the head picture negative leader the film report number and reel number will be written in, following the printing start frame, at the frame provided.

(3) On the tail leaders, this information will be written on the frames provided, following the "Finish" title frames.

DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)									
1. TITLE	AGENCY	NUMBER								
3. DESCRIPTION/PURPOSE A progress/status meeting report records the minutes of periodic meetings between key contractor and key Government personnel to review jointly the project progress to date, reach decisions on major problem areas and determine the future course of the project.	Army	DI-A-1005								
7. APPLICATION/INTERRELATIONSHIP	4. APPROVAL DATE 15 Dec 69									
	5. OFFICE OF PRIMARY RESPONSIBILITY USAMC									
	6. APPROVAL LIMITATION									
	9. REFERENCES (Mandatory as cited in block 10)									
10. PREPARATION INSTRUCTIONS	MCBL NUMBER(S)									
<p>A summary of each meeting will be prepared which will include a discussion of items presented for decision and proposed actions to be taken.</p> <p>The progress/status meeting report will be in narrative form in the following format:</p> <p style="text-align: center;">(Company Letterhead)</p> <p>PROJECT _____ DATE _____</p> <p>Present at the meeting held at _____ on (date) _____ were the following:</p> <table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">NAME</th> <th style="text-align: center;">ORGANIZATION</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> </tbody> </table> <p>Items which were discussed at the meeting are summarized below: (NOTE: Each item will follow these guidelines)</p> <p>a. Item. State briefly the item (or problem).</p>			NAME	ORGANIZATION	_____	_____	_____	_____	_____	_____
NAME	ORGANIZATION									
_____	_____									
_____	_____									
_____	_____									

DI-A-1005

Preparation Instructions (Continued)

- b. **Discussion.** Summarize pertinent information associated with the item.
- c. **Recommendation.** Both the contractor's and the project manager's recommendations will be listed unless they are the same.
- d. **Action.** A brief statement of what agreements were reached, action required by the contractor and/or the project manager, the action officer(s) and/or office(s) assigned responsibility for coordinating required actions, contractual action required, and all key dates.

DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)	
1. TITLE	AGENCY	NUMBER
3. DESCRIPTION/PURPOSE This data item provides for the preparation of engineering drawings and associated lists in the formats required by the procuring activity. Engineering drawings and lists are used for manufacture, design, test, installation, maintenance and logistic support.	Army	DI-E-1118
7. APPLICATION/INTERRELATIONSHIP Engineering drawings and associated lists are included in the technical data package and, together with specifications and other data, establish the functional, allocated and product baselines of configuration management. This data item is related to: DI-E-1103, Engineering Release Record DI-E-1104, Specifications and Purchase Descriptions DI-E-1112, Aperature Cards DI-E-1115, Technical Data Package DI-E-1126, Notice of Revision/Specification Change Notice	4. APPROVAL DATE 15 Dec 69	
	5. OFFICE OF PRIMARY RESPONSIBILITY USAMC	
	6. DDC REQUIRED	
	8. APPROVAL LIMITATION	
10. PREPARATION INSTRUCTIONS Prepare engineering drawings in accordance with instructions in MIL-D-1000 and shall conform to Category A Form 1. The contracting officer will furnish drawing Vellum and drawing identification number.	9. REFERENCES (Mandatory as cited in block 16) MIL-D-1000 MIL-STD-100	
	MCSL NUMBER(S) 10060	

DATA ITEM DESCRIPTION		2 IDENTIFICATION NO(S)	
		AGENCY	NUMBER
1. TITLE Software for Other than Business Oriented Computer Programs/Systems		Army	DI-E-1125
3. DESCRIPTION/PURPOSE These programs, either integral to computer/machine combinations or antities within themselves, will be used to either verify contractor submittals or operate computer/machine combinations.		4. APPROVAL DATE 15 Dec 69	
		5. OFFICE OF PRIMARY RESPONSIBILITY USAMC	
		6. DDC REQUIRED	
		7. APPROVAL LIMITATION	
7. APPLICATION/INTERRELATIONSHIP		8. REFERENCES (Mandatory as cited in block 10.)	
		MCSL NUMBER(S)	
10. PREPARATION INSTRUCTIONS			
<ol style="list-style-type: none"> 1. Prepare and submit software in the form of punch cards. 2. Documentation should consist of: <ol style="list-style-type: none"> a. Short description of problem b. Description of method of solution c. List of equations used in computer program solution d. Definitions of input symbols in program e. Definitions of generated symbols in program f. Definitions of output symbols in program g. Listing of program source deck h. Listing of sample input i. Listing of sample output 			

DI-E-1125

Preparation Instructions (Continued)

- j. Running instructions for program, and estimate of running time.
 - k. Statement of type and configuration of computer used in program development, including any special features required by the program.
 - l. Program language used shall be Fortran IV. The contractor shall request deviation for use of any other language stating justification for deviation.
 - m. Computer configuration and memory requirements.
 - n. Flow chart of program.
3. Software should consist of:
- a. Two (2) copies of the program source deck.
 - b. One (1) copy of sample input deck.

NOTE: All decks should be clearly marked as to contractor or originator, programming language, program name, and type of deck (source, data, etc.).

4. This data item is intended to require the contractor to provide computer programs for Scientific computer programs, such as, e.g., those used to develop trajectories, mathematical models for reliability and maintainability programs.
5. Terms used in this data item description are defined in AR 18-7.

DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)	
	AGENCY	NUMBER
1 TITLE Human Factors Engineering Plan	Army	DI-H-1312
3 DESCRIPTION/PURPOSE The Human Factors Engineering (HFE) Plan is the contractor's proposal for HFE effort. The information will be used by the procuring activity as a basis for review of the contractor's progress.	4 APPROVAL DATE 15 Dec 69	
	5 OFFICE OF PRIMARY RESPONSIBILITY USAMC	
	6 OOC REQUIRED	
	8 APPROVAL LIMITATION	
7 APPLICATION/INTERRELATIONSHIP DI-H-1314, Human Factors, Engineering Progress Reports DI-H-1315, Human Factors Engineering Final Report DI-H-1316, Operator/Maintainer Position Planning Data DI-H-1317, Operator/Maintainer Taskload Analysis DI-H-1318, Analysis of Critical Tasks DI-H-1319, Human Factors Engineering Design Approach Document	9 REFERENCES (Mandatory as cited in block 10) AR 602-1 AMCR 201 MIL-H 46855 MIL-STD-1472 TM 38-760	
	MCSL NUMBER(S)	
10 PREPARATION INSTRUCTIONS The plan shall describe an integrated effort within the total project, it shall contain specific information to show how the contractor will meet specified HFE requirements. Unless otherwise indicated, the proposed HFE plan shall be submitted as a separate and complete entity within the total system or equipment project proposal. The HFE plan shall include, but not necessarily be limited to the following sections: 1. Organization. This section shall identify and describe the contractor's primary organizational element responsible for complying with the HFE requirements. It shall also indicate the relationship of this organizational element to elements having equipment design authority and, as applicable, to elements responsible for other areas relating to the effective accomplishment of the HFE effort, such as test and evaluation, safety, and training. The authority delegated to these elements for insuring action shall be stipulated. The functions and internal structure of the element performing HFE shall be defined. 2. HFE in Subcontractor Efforts. If any HFE work is to be performed pursuant to a major subcontract, the contractor's element responsible for HFE shall be described to the same extent as the prime contractor's HFE organization is covered. A copy of the HFE requirements proposed for inclusion in the subcontract shall be included, as applicable.		

DI-H-1312

Preparation Instructions (Continued)

3. **HFE in System Engineering Analysis.** This section shall summarize applicable HFE efforts in system engineering analysis as specified by MIL-H-46855.

4. **HFE in Maintenance Engineering.** This section shall summarize applicable HFE efforts which Interplay with maintenance engineering analysis as it pertains to operator maintenance personnel organizational and maintenance equipment and time requirements for the performance of operator and maintenance tasks.

5. **HFE in Equipment Detail Design.** This section shall describe the HFE effort in equipment detail design to be conducted in accordance with MIL-H-46855 and Human Engineering Laboratory Standard S-4-65.

6. **HFE in Equipment Procedure Development.** This section shall describe the HFE effort in equipment procedure development to be conducted in accordance with MIL-H-46855.

7. **HFE in Test and Evaluation.** This section shall describe the proposed HFE design verification program performed in accordance with MIL-H-46855. The techniques to be utilized, the human factors personnel involved, and the scheduling of HFE test and evaluation activities shall be summarized.

8. **Time-Phased Schedule.** This section shall consist of a time-phased schedule which indicates the HFE work and milestones to be accomplished, and a PERT diagram of the HFE program and identification of any milestones therein which form a part of the total system PERT diagram.

9. **HFE in Design Reviews.** The plan will reflect how the contractor's system design review meetings/exercises will be used to evaluate HFE considerations in design. It shall reflect functions and equipments to be evaluated and procedures/techniques/checklists to be used.

DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)	
	AGENCY	NUMBER
1. TITLE Human Factors Engineering Progress Reports	Army	DI-H-1314
3. DESCRIPTION/PURPOSE The Human Factors Engineering (HFE) Progress Reports are analyzed to insure that HFE considerations are reflected in system design and development and to insure compliance with contract requirements for HFE and the HFE Plan.	4. APPROVAL DATE 15 Dec 69	
	5. OFFICE OF PRIMARY RESPONSIBILITY USAMC	
	6. DOC REQUIRED	
	8. APPROVAL LIMITATION	
7. APPLICATION INTERRELATIONSHIP DI-H-1312, Human Factors Engineering Plan	9. REFERENCES (Availability as cited in Block 10) AR 602-1 AMCR 70-1 MIL-H-46855 MIL-STD-1472	
	MCSL NUMBER(S)	
10. PREPARATION INSTRUCTIONS <p>Progress reports shall include HFE as a separate topic. Progress and activity associated with the program outlined in the HFE plan shall be reported in sufficient detail to demonstrate that HFE considerations are reflected in system engineering analyses, design and development, and test and evaluation. Progress reports shall be concise and shall not unnecessarily repeat previously reported material. Changes may be indicated by reference to past reports rather than by resubmission of an entire set of data, information or plans. Where data are furnished by other reporting media, they shall be referenced by, rather than included in the progress report. The reports shall also include, where applicable, the results of studies conducted during systems engineering analysis to determine the man-equipment combinations required, along with flow charts, function analyses, function allocation tabulations, operational sequence diagrams and other working data upon which results are based.</p> <p>The reports shall describe HFE efforts on operating procedures, equipment design, working environment design, research and testing of HFE problems and recommended solutions.</p>		

DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)							
1 TITLE	AGENCY	NUMBER						
3 DESCRIPTION/PURPOSE	Army	DI-H-1320A						
<p>The system safety program plan (SSPP) describes the contractor's internal organization and procedures to be followed to assure that: optimum safety is designed into the system; timely identification and correction of hazards are made; adequate controls over outstanding hazards are established; minimum risk is involved in the acceptance and use of new systems; retrofit actions and costs to improve safety are reduced; and historical safety data is used.</p> <p>The SSP shall be submitted as an integral part of the contractor's response to the request for proposal (RFP). The plan, when evaluated and approved, shall be incorporated into the development/production contract. This plan is related to data items:</p> <table border="0" data-bbox="184 920 1029 1081"> <tr> <td>DI-H-1321, Explosive Hazard Classification Data</td> <td>DI-H-1327, Surface Danger Area Data</td> </tr> <tr> <td>DI-H-1322, Safety Statement</td> <td>DI-H-1328, Accident Prevention Safety Program</td> </tr> <tr> <td>DI-H-1323, Accident Report (Continued)</td> <td></td> </tr> </table>	DI-H-1321, Explosive Hazard Classification Data	DI-H-1327, Surface Danger Area Data	DI-H-1322, Safety Statement	DI-H-1328, Accident Prevention Safety Program	DI-H-1323, Accident Report (Continued)		4 APPROVAL DATE	5 OFFICE OF PRIMARY RESPONSIBILITY
	DI-H-1321, Explosive Hazard Classification Data	DI-H-1327, Surface Danger Area Data						
	DI-H-1322, Safety Statement	DI-H-1328, Accident Prevention Safety Program						
	DI-H-1323, Accident Report (Continued)							
4 Jun 71	6 DDC REQUIRED	USAMC-SF						
8 APPROVAL LIMITATION	9 REFERENCES (Mandatory be listed in block 10)							
	AR 385-16 AR 705-5 AR 70-10 AR 70-27 AR 700-20 AMC Sup. No. 1 to AR 385-16 MIL-STD-882 DA PAM 11-25							
10 PREPARATION INSTRUCTIONS	MCSL NUMBER(S)							
	31520							
<p>1. This SSPP shall satisfy the requirements of MIL-STD-882, to ensure that adequate consideration is given to safety during the Advance Development Phase, and to establish a formal, disciplined program to achieve the system safety objectives.</p> <p>2. The SSPP shall:</p> <ol style="list-style-type: none"> Establish those elements necessary to meet the safety objectives. Identify organizational agencies by functional activity (specifying their interrelationships and their responsibilities) necessary to implement and sustain the safety program. Delineate management responsibilities for program decisions and directions involving safety: state the contractor's (company) policy on safety. Designate a focal point for the system safety engineering effort. List the engineering requirements and criteria for design safety. List safety standards and system specifications containing safety requirements by which the contractor intends to comply in the development of the system. 								

DI-H-1320A
Application/Interrelationship (Continued)

DI-H-1324, Accident Exposure Summary	DI-H-1329, Accident/ Incident Safety Program
DI-H-1325, Nuclear Safety Studies & Reviews	DI-H-1330, Facilities Safety Data
DI-H-1326, Safety Analyses and Hazard Evaluation	DI-H-1331, Aircraft Accident Report
	DI-H-1332, Radio Active Material
	DI-H-1333, Safety Analyses for Aviation Systems

Preparation Instructions (Continued)

3. The SSPP shall define a program in which design analyses, studies and system testing will establish system performance limitations, failure-modes, safety margins and identify critical operator tasks. Where human performance is critical to safe operations, training requirements and lesson plans will include safety information; exams will test personnel knowledge.
4. The SSPP shall specify procedures for providing for review of technical publications.
5. The SSPP shall describe the system safety management/engineering effort as an integral of the total program; interdisciplinary activities shall be identified.
6. The SSPP shall include, but not be limited to:
 - a. A detailed listing and description of specific safety program tasks.
 - b. Identification of the organizational unit responsible for executing each task.
 - c. A program schedule of safety tasks, showing start and complete dates, milestones, reviews, etc.
 - d. Procedures for reporting program status.
 - e. Description of studies and analyses to be performed; mathematical methods to be used; appropriate system models and analytical techniques to be employed.

DI-H-1320A

Preparation Instructions (Continued)

7. The SSPP, of necessity, shall need to be updated throughout the contract to be consistent with progress and program changes. The SSPP shall allow for the maximum utilization of information/data from other elements of the program, e.g., reliability, maintainability, testing, etc., without duplication. The prime contractor's plan shall coordinate the SSPP of all subcontract effort. In addition, the SSPP shall describe safety contribution to the following:

- a. System/design engineering, e.g., airborne and ground support equipment
- b. Integrated Logistic support
- c. Test and test planning
- d. Training and training equipment
- e. Operator and maintenance publications
- f. Facilities design and layout
- g. Manufacturing and quality assurance.

8. The SSPP shall indicate the methods by which safety engineering monitors test plans, programs, procedures, reports and data to assure consideration of safety engineering principles, information and requirements. Also, the procedures to assure feed-back of test information, for review and analysis, for use in design modifications shall be included. Test areas to be considered are as follows:

- a. Storage and transportation (DOT) hazard classification tests
- b. Operational environmental tests
- c. Range safety (static and dynamic) tests
- d. Critical material developmental tests
- e. Flight tests (aircraft)
- f. Transportability tests
- g. Other.

DI-H-1320A

Preparation Instructions (Continued)

9. The SSPP shall specify those analyses to be made to define hazards, both real and potential, which may result from system malfunction, equipment failure, premature activation (operation), etc. The analyses shall classify all failures as either safe, marginal or critical, as shown in MIL-STD-882. Further categorization shall be made by which each of the subsystem areas can be evaluated effectively against hazardous conditions that may be encountered. The following categories are suggested and cover the basic hazard areas for evaluation:

- a. Nuclear
- b. Explosive
- c. Electrical and electronic
- d. Mechanical, hydraulic, pneumatic, etc.
- e. Environmental; i.e., temperature, shock, vibration, etc.
- f. X-ray and microwave radiation
- g. Chemical and biological
- h. Other (such as electromagnetic radiation, nuclear effects, etc.)

10. The SSPP shall contain procedures for corrective action to eliminate all deficiencies identified from the safety analyses and the hazard evaluation studies that have been conducted on the system. The SSPP shall cover procedures for notification of all critical hazards and actions proposed, or taken, to correct them to ensure that such information is developed for the procuring agency. The plan shall contain provisions for the development of system emergency procedures.

11. The Reporting of Safety Information section shall describe the methods by which the contractor will provide the developing agency with notification of progress, hazards, accidents/incidents or malfunctions, deviations, etc.

12. The SSPP shall define the contractor's procedure for notifying the procuring agency of program deviations where requests for waivers or exemptions to safety requirements are necessary.

DATA ITEM DESCRIPTION	2. IDENTIFICATION NO(S)	
1. TITLE	AGENCY	NUMBER
Safety Statement 3. DESCRIPTION/PURPOSE The safety statement shall provide the developing agency with a formal comprehensive safety report on the final design of a hazardous item or system. The safety statement shall identify all system safety features, inherent design and procedural hazards, and shall establish special procedures and/or precautions to circumvent the hazards.	Army	DI-H-1322A
7. APPLICATION/INTERRELATIONSHIP The development of data for the safety statement shall be interrelated to all contract milestones through test report approval and data items: DI-H-1320, System Safety Program Plan DI-H-1326, Safety Analyses and Hazard Evaluation Reports DI-H-1332, Radioactive Material	4. APPROVAL DATE 4 Jun 71	
	5. OFFICE OF PRIMARY RESPONSIBILITY USAMC-SF	
	6. OOC REQUIRED	
	8. APPROVAL LIMITATION	
10. PREPARATION INSTRUCTIONS 1. The safety statement is a summary of tests, analyses and other data collected during the advance development phase which identifies the hazards which may be presented by the item/system, together with the action taken, or the recommended procedures to be followed to minimize these hazards and to reduce the exposure of personnel, equipment and property. 2. This data, compiled in the form of a narrative report, shall be submitted to the developing agency. Also, a safety statement will be required for any design changes or modifications that might affect safety evaluations or safe operations. 3. The suggested format for system safety statement is as follows:	9. REFERENCES (Mandatory as cited in block 10) AR 385-16 AR 70-10 AMCR 385-12 MIL-STD-882	
	MCSL NUMBER(S) 31520	

GENERAL FORMAT FOR SAFETY STATEMENT

1.0 Introduction.

State purpose of Safety Statement.

2.0 System.

Description of system, identifying components and operational requirements.

3.0 Conclusions.

Statement that system is safe for testing with exceptions listed for all real or potential hazards that may be encountered with specific safety recommendations to insure the safety of personnel, equipment and property involved in the test program. The associated hazards and recommendations should be categorized as to whether or not they may be expected under normal or abnormal operating conditions. To facilitate hazard identification, general areas of consideration should cover nuclear, explosive, mechanical, electrical/ electronic, personnel and composite type hazards as applicable.

4.0 Sequence of Operations.

Present a complete sequence of system operations emphasizing the safety features.

5.0 Failure Mode Analysis.

5.1 Summarize analyses furnishing probability of occurrence plus effects.

5.2 Show results of any tests conducted to validate analyses.

6.0 References.

List all pertinent references such as Analyses, Test Reports and Draft TM (Preliminary Operating and Maintenance Manuals).

DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)	
1. TITLE	AGENCY	NUMBER
3. DESCRIPTION/PURPOSE Safety analyses and hazard evaluation reports are used to assess design and to identify hazards, both real and potential, for the purpose of their elimination or control. Qualitative safety analyses provide a technical assessment of the relative safety of a design; quantitative safety analyses provide a numerical assessment of the safety level of a design.	Army	DI-H-1326A
7. APPLICATION/INTERRELATIONSHIP DI-E-1102, Engineering Change Proposals DI-S-1818, Maintenance Engineering Analysis DI-H-1320, System Safety Program Plan DI-H-1322, Safety Statement DI-H-1325, Nuclear Safety Studies and Reviews DI-H-1327, Surface Danger Area Data DI-H-1332, Radioactive Material DI-H-1333, Safety Analyses for Aviation Systems	4. APPROVAL DATE 4 June 71	
	5. OFFICE OF PRIMARY RESPONSIBILITY USAMC-SF	
	6. ODC REQUIRED	
	8. APPROVAL LIMITATION	
10. PREPARATION INSTRUCTIONS 1. Reports of safety studies, analyses, and evaluations, which have been conducted in accordance with the contract scope of work on components, sub-assemblies, equipment or the system, shall be prepared in a narrative form showing analytical technique, or procedure, conclusions and the recommended corrective action to eliminate or control hazardous conditions. Where more than one solution is possible, the report shall contain all reasonable solutions, in order of recommended priority, explaining trade offs. 2. The required reports of the following types are: a. Preliminary Hazard Analysis. This analysis is performed as the initial investigation of a concept, or design, to identify safety critical areas for the system under study, to evaluate inherent hazards, and to establish the controlling design criteria to be used. The Preliminary Hazard Analysis is a comprehensive, qualitative (nonmathematical) assessment of a system/equipment design which is conducted early in the concept formulation (or design definition) phase.	9. REFERENCES (Mandatory as cited in block 10) AR 385-16 AR 385-25 AMCR 385-12 AMC Sup. No. 1 to AR 385-16 MIL-STD-882 TM 38-250	
	MCSL NUMBER(S) 31520	

DI-H-1325A

Preparation Instructions (Continued)

b. **Operational Safety Analyses.** These analyses shall consider safety requirements of personnel, procedures, and equipment for conducting maintenance, support, test, and training mission requirements for all operations of tactical employment. An engineering design analysis shall be accomplished for review and for developing recommendations concerning the system operational safety characteristics. Safety analyses of engineering data, procedures, and instructions developed for early test program operations shall be reviewed. Emergency, escape, egress, and rescue procedures for maintenance and operational personnel shall be developed from these analyses. This information shall provide the basis for initial operating and maintenance manuals/handbook procedures.

c. **System Integration Safety Analyses.** These analyses shall define the safety interfaces between subsystems and identify safety problem areas for the combined system. These analyses shall provide subsystem interrelations for compliance with the failure criteria, shall establish performance tolerances and shall be updated for all system changes affecting safety.

d. **Maintenance Hazard Analyses.** Studies during the initial design period shall review the safety problems for the system maintenance activities.

DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)	
	AGENCY	NUMBER
1 TITLE Product Assurance Test, Demonstration and Evaluation Plan	Army	DI-R-1701
3 DESCRIPTION/PURPOSE 1. This plan provides the Test, Demonstration and Evaluation (TD and E) Program requirements for Reliability/Maintainability, Quality and Performance assessment. 2. It provides the system of material peculiar requirements for acceptance inspection not a part of MIL-0-9858 general requirements. (Continued)	4 APPROVAL DATE USAMC	
	5 OFFICE OF PRIMARY RESPONSIBILITY	
	6 ODC REQUIRED	
	8 APPROVAL LIMITATION	
7 APPLICATION/INTERRELATIONSHIP 1. This item will not be specified separately when included as part of DI-R-1700 2. Where feasible for cost and organizational advantages, reliability, maintainability, quality and assessment will be integrated into a single product assurance test plan. 3. Product Assurance Test, Demonstration, and Evaluation Reports resulting from this plan, which are a part of acceptance inspection of equipment built or rebuilt by the Government or contractor, are obtained under Quality Inspection report, principally DI-R-1724.	9 REFERENCES (Mandatory as cited in Block 10) AR 70-10 AR 70-27 AR 705-50 and AMC Suppl 1 AMCR 700-6 AR 705-5 TM 38-760 AR 71-3 MIL-STD-785 MIL-Q- MIL-STD-470 9858	
	MCSL NUMBER(S) 10097 30470 50381 50440	
10 PREPARATION INSTRUCTIONS 1. The Test, Demonstration and Evaluation Plan shall encompass the detail requirements for reliability, maintainability, demonstration or evaluation. 2. A comprehensive test, demonstration and evaluation plan shall be prepared and shall include the following: a. Scheduled and detail description of thy test demonstration or evaluation to be reported upon. b. List of proposed reliability testing, except those conducted at a minor component level for design feasibility or experimental analysis purposes. This should include sample size, environments for each test, test schedule, test philosophy and objectives, success-fail criteria for each test, type of analysis to be performed on the test results, and statistical risks associated with the test design. c. Description of the role of each test in the evaluation of system reliability, and an outline of major alternative actions, as may be determinable, to be taken as a result of each test. d. The requirement for various types and degrees of testing based on the Reliability and Maintainability Mathematical Model(s).		

DI-R-1701

Description/Purpose (Continued)

3. It is used to assure an adequate overall Product Assurance TD and E program while eliminating unnecessary testing. It is used for program evaluation and provides management with planning information for resource requirements and scheduling of proposed tests. It provides associated requirements for data collection and corrective action activities.

Application/Interrelationship (Continued)

4. Product Assurance Input to Coordinated Test Plan -- results of tests conducted for evaluation and determination of subsequent engineering action are obtained under DI-T-1906.

5. Product assurance inputs to user test reports will be reported as specified.

- DI-R-1710, Quality Program Plan
- DI-R-1730, Reliability Program Plan
- DI-R-1740, Maintainability Program Plan
- DI-R-1750, Assessment Program Plan
- DI-R-1818, Maintenance Engineering Analysis

Preparation Instructions (Continued)

e. Description of the planned use of test data in confirming or adjusting the Reliability or Maintainability Mathematical Model(s) and in the determination of quantitative system reliability.

f. Test procedures.

3. The proposed Test, Demonstration and Evaluation Plan shall be updated as required on DD Form 1423.

DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)	
	AGENCY	NUMBER
1 TITLE Reliability Program Plan	Army	DI-R-1730
3 DESCRIPTION/PURPOSE 1. This plan describes how the Reliability Program will be conducted. It describes the specific techniques and activities to be performed and their integration and development in conjunction with other specified related plans. 2. This data item will serve any of the following purposes:	4 APPROVAL DATE 15 Dec 69	
	5 OFFICE OF PRIMARY RESPONSIBILITY USAMC	
	6 OOC REQUIRED	
	8 APPROVAL LIMITATION	
7 APPLICATION/INTERRELATIONSHIP 1. This data item is provided to permit preparation of the Reliability, Maintainability, Quality, or Assessment Programs by separate contractors when desirable. Cost, system integration, and method of contracting are prime considerations in preparation of a single DI-R-1700, Product Assurance Program Plan or separate coordinated plans. 2. The data developed in accordance with this plan and other Program Plans provide input to design/development engineering and maintenance engineering.	9 REFERENCES (Mandatory as cited in block 10) AR 70-27 AR 705-5 AR 705-50 AMC Suppl 1 MIL-STD-105, 414 MIL-STD-756, 781, 785 MIL-HBBK-217 AMCP 702-3 AMCP 715-4 TM 38-703 Series	
	MCSL NUMBER(S) 50911 50440	
10 PREPARATION INSTRUCTIONS 1. The plan will outline the methods and techniques for incorporating reliability into design and for conducting a comprehensive program in accordance with the contract scope of work or regulations and specifications as listed in the DD Form 1423. It will portray how reliability will be achieved in sufficient detail to include schedule, techniques, procedures, and responsibility for each specific task. 2. The Plan must be appropriate and include but not necessarily limited to the following: a. The contractor's plan is first prepared in response to the RFP. The contractor will be expected to expand and modify the plan as necessary during this contract. The plan shall include the requirements of MIL-STD-785. All plans shall identify action to be taken to assure reliability if any material is to be developed elsewhere. 3. The general format for the development of the Program Plan is as follows: a. Program Summary. A summary shall be prepared to include cost and scheduling inputs. b. Program Management and Control. For all activities and functional areas outline.		

DI-R-1730

Description/Purpose (Continued)

a. The principle use is to provide a detailed description of a contractor's Reliability Program to be accomplished under the contract of which the data item is a part. This use provides the procuring activity a basis for review of the contractor's progress and evaluation of his proposed techniques.

b. It may be used to describe how the material developer (Government) will conduct the life-cycle reliability Program for a material or system.

c. It may be used for a specific life-cycle phase of AR 11-25.

3. The plan assures a logical conduct of the Reliability Program necessary for system development. It assures and verifies the accomplishment of reliability necessary for the Integrated Logistics Support Program.

Application/Interrelationship (Continued)

3. This plan is required when there is an operational significance, which requires incorporation into design of the assurance of reliability.

4. Data items DI-R-1701 through 1704 may be specified separately or the reliability portions included herein. When 1701-04, all or in part, are specified separately for visibility, significance, or cost affectiveness, the DI-R-1730 will only summarize briefly the time phasing and interrelationship of the separately detailed item to the program.

DI-R-1701 Product Assurance Test, Demonstration and Evaluation Plan

DI-R-1702 Product Assurance Design and Program Review Schedule

DI-R-1703 Product Assurance Design and Program Review Report

DI-R-1704 Product Assurance Failure Analysis and Corrective Action Reporting Plan

DI-R-1724 Quality Inspection Test, Demonstration and Evaluation Report

DI-S-1618 Maintenance Engineering Analysis

Preparation Instructions (Continued)

(1) Organization, responsibilities, internal assessment plan and procedures, contracting plans and control - Indicate method of liaison and communication to other programs. Contract plans should indicate subcontractor and vendor control.

DI-R-1730

Preparation Instructions (Continued)

(2) Design and Program Review. The reliability review program will be conducted through review of reports specified in DI-R-1731.

(3) Failure Analysis and Corrective Action Report - Reporting shall be as specified in DI-R-1734 and DI-R-1735.

c. Reliability Activities and Function Areas.

Activities and Function Areas. Describe the procedures and which activities and functional areas will be used to achieve program objectives. Specification review, prediction, apportionment, component reliability, failure effects and criticality analysis design review, program review, critical and/or controlled item determination, environmental criteria determination, fault detection analysis, fault correction analysis, failed parts analysis, failed part data, storage effects, block diagrams, mathematical models, other performance analysis and reliability goals if required, and planned method of accomplishment of reliability parameters and characteristics.

d. Test and Demonstration Program. Indicate the test, demonstration, and evaluation program as described in MIL-STD-785 and DI-R-1701 or specify 1701 and only briefly interface herein. Provide evidence of integrating as feasible for cost effectiveness with other test demonstration and evaluations as specified.

DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)	
	AGENCY	NUMBER
1. TITLE Reliability Reports	Army	DI-R-1731
3. DESCRIPTION/PURPOSE These reports are used to monitor the contractor's Reliability Program and to provide the means for timely corrective action to be taken when necessary. These reports will also provide backup for preparation of the end item Reliability Assessment Report (AMCR 702-8), DI-R-1752.	4. APPROVAL DATE 15 Dec 69	
	5. OFFICE OF PRIMARY RESPONSIBILITY USAMC	
	6. DDC REQUIRED	
	8. APPROVAL LIMITATION	
7. APPLICATION/INTERRELATIONSHIP DI-R-1730, Reliability Program Plan	* REFERENCES (Mandatory as cited in Block 10) MIL-Q-9858 MIL-STD-756 MIL-STD-781 MIL-STD-785 AMCR 70-7 AMCR 700-6 AMCR 702-8 AR 705-50 & USAMC Suppl 1	
	MCSL NUMBER(S) 50440	
10. PREPARATION INSTRUCTIONS		
<p>1. Reports shall be prepared and submitted in conformance with the Reliability Plan, or as otherwise specified in the contract. These data may be presented as separate reports submitted intermittently as data is generated, or may be included in the regular periodic progress reports, whichever is specified on the DD Form 1423.</p> <p>2. The reports shall contain all pertinent reliability information and provide complete accounting of progress for each task defined in the Reliability Program Plan, results achieved, and status of actions to resolve major problems and correct weak tasks. Reports shall include charts or other illustrations comparing objectives minimum requirements, predictions, and the level of achieved reliability. Mathematical equations utilized and steps followed shall be included.</p> <p>3. The following are the types of reports that are required:</p> <p>a. Reliability Progress Reports. These reports would list the significant accomplishments or problems occurring during the reporting period.</p> <p>b. Reliability Data Summary Report. This report would be prepared from the reliability data base or record maintained in accordance with AR 705-50. Types of information for data base include the following:</p>		

DI-R-1731

Preparation Instructions (Continued)

- (1) Design Specifications and Delineation
- (2) Design Review – Minutes, action items, and reports
- (3) Functional/Operational Analyses
 - (a) Environmental Criteria, (Reference DI-E-1119)
 - (b) Environmental/Functional Stress – time and space profiles
 - (c) Actual Analyses and assumptions
- (4) Failure mode, effect, and criticality analyses
- (5) Failure definition and distribution criteria with analyses and assumptions
- (6) Failure reporting formats and procedures
- (7) Test operation history – Matrix Reports
Class-Objective-Assembly Level-Development Maturity-Environmental/
Functional Stress/Time Log
- (8) Failure Summary Reports
 - (a) Failure cause analyses
 - (b) MTBF Summaries for major elements, sub-assemblies, and system
- (9) Reliability Studies
 - (a) Failure rate reference and interpretation
 - (b) Design goal allocation analyses
 - (c) Predictions and estimates
 - (d) Assessment of achieved Reliability.

c. Failure Analyses Reports.

These reports shall be prepared from failure data. This shall be accomplished by the utilization of a uniform and compatible reporting and feedback system designed to collect and disseminate part, equipment, and system reliability data. Such data will be collected from design, acceptance, laboratory, field, and flight tests and will be maintained as applicable in a reliability data file. All information shall be analyzed and evaluated and histories maintained as appropriate on all levels of products.

Included as part of the failure analyses documentation shall be the identification of similar or related parts which may contain the same inherent weakness or which would benefit by a similar improvement. These reports will include such information as the complete identification of the failure, the parts application, its environment, the mode and cause of failure, corrective actions taken, and other known applications of the part, etc.

DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)	
1 TITLE	AGENCY	NUMBER
3 DESCRIPTION/PURPOSE	Army	DI-R-1732
<p>Reliability Mathematical Model(s) is used, to apportion reliability requirements to various functions and/or levels of hardware within the total system, to predict the probability of the design meeting these requirements, and later for reliability assessment.</p> <p>DI-R-173C. Reliability Program Plan</p> <p>The Reliability Mathematical Model shall utilize data from DI-S-1816 Maintenance Engineering Analysis (MEA) when applicable.</p> <p>This data item may be integrated with DI-R-1742, Maintainability Math Model where feasible for cost and administrative advantages.</p>	4 APPROVAL DATE 15 Dec 69	
	5 OFFICE OF PRIMARY RESPONSIBILITY USAMC	
	6 DDC REQUIRED	
	8 APPROVAL LIMITATION	
10 PREPARATION INSTRUCTIONS	9 REFERENCES (Maintainability as cited in block 7) MIL-STD-756 MIL-STD-785 MIL-HDBK-217 AR 705-50 and AMC Suppl 1 AMCR 700-6 AMCR 702-8 TM-38-703 Series	
	MCSL NUMBER(S) 50440 50911	
<p>1. The Reliability Mathematical Model(s) shall be developed to apportion reliability requirements, predict design reliability and assess achieved reliability. The mathematical model shall be supplemented by a reliability block diagram of the system (or missions, functions, etc). Where feasible a single model will be prepared.</p> <p>2. The mathematical model will address the system equipment elements through the subassembly level.</p>		

DATA ITEM DESCRIPTION		2. IDENTIFICATION NO(S)	
1. TITLE		AGENCY	NUMBER
3. DESCRIPTION/PURPOSE		Army	DI-R-1733
7. APPLICATION/INTERRELATIONSHIP		4. APPROVAL DATE 15 Dec 69	
		5. OFFICE OF PRIMARY RESPONSIBILITY USAMC	
		6. DDC REQUIRED	
		8. APPROVAL LIMITATION	
10. PREPARATION INSTRUCTIONS		9. REFERENCES (Mandatory as cited in block 10) AMCR 700-6 AR 705-50 and AMC Suppl 1 MIL-STD-785	
		11. HCSL NUMBER(S) 50440	
<p>Prepare and maintain current, a list of items that have been reliability qualified for use in the system. This list shall consist of those materials, parts, components, assemblies, or modifications thereto, etc., which, through tests, have met the specified design qualification requirements. The environmental limits, stresses, etc., to which the item has been successfully subjected will be provided as a part of the list.</p>			

DATA ITEM DESCRIPTION	2. IDENTIFICATION NO(S)	
1. TITLE	AGENCY	NUMBER
Reliability Failure Modes, Effects, and Criticality Analyses Report	Army	DI-R-1734
3. DESCRIPTION/PURPOSE Failure data prepared in compliance with this data item is used by the responsible developing agency to identify potential failures and their effects if they occur. The data also serves to determine system failure interactions, provides criteria for selection of items for reliability testing, assists in making design trade-offs, and permit early recommendation for redesign.	4. APPROVAL DATE 15 Dec 69	
	5. OFFICE OF PRIMARY RESPONSIBILITY USAMC	
	6. DDC REQUIRED	
	8. APPROVAL LIMITATION	
7. APPLICATION/INTERRELATIONSHIP DI-R-1703, Product Assurance Design and Program Review Report DI-R-1730, Reliability Program Plan DI-S-1818, Maintenance Engineering Analysis	9. REFERENCES (Mandatory as cited in block 10) MIL-STD-785 AMCR 700-6 TM 38-703-3 AR 705-50 and USAMC Suppl 1	
	MCSL NUMBER(S) 50440 50911	
10. PREPARATION INSTRUCTIONS 1. The Failure Modes, Effects, and Criticality Analyses Report shall list the following for each item and/or function as a minimum: a. Possible failure modes b. Probability of occurrence for each failure modes c. Times during a mission the failure mode can occur d. Classification of the failure mode (critical, major, minor). 2. Failure Modes, Effects, and Critically Analyses shall be prepared to the hardware or function level specified in the contract. 3. Failure Modes, Effects, and Critically Analyses shall be prepared, updated, and submitted to the developing agency as stipulated on DD Form 1423.		

DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)	
1. TITLE	AGENCY	NUMBER
3. DESCRIPTION/PURPOSE This report will be used in analyzing modes and causes of failure, failure histories, and the need for corrective action on critical items.	Army	DI-R-1735
7. APPLICATION/INTERRELATIONSHIP DI-R-1730, Reliability Program Plan DI-R-1703, Product Assurance Design and Program Review Report DI-T-1906, Test and Demonstration Reports	4. APPROVAL DATE 15 Dec 69	
	5. OFFICE OF PRIMARY RESPONSIBILITY USAMC	
	6. DDC REQUIRED	
	8. APPROVAL LIMITATION	
10. PREPARATION INSTRUCTIONS 1. A report shall be prepared for each failure analysis performed on a critical item. The report shall specify failure analysis method used, such as X-ray, sectioning the item for microscopic or photographic study, spectrographic analyses, and/or dimensional analyses. 2. The mode of failure, the physical or chemical cause of failure, failure history of the item for all usage to date, and recommended corrective action shall be listed in each report as a minimum.	9. REFERENCES (Mandatory as cited in block 10) MIL-Q-9858A MIL-STD-785 AMC 700-6 AR 705-50 and USAMC Suppl 1	
	MC SL NUMBER(S) 50440	

DATA ITEM DESCRIPTION	2. IDENTIFICATION NO(S)	
1. TITLE	AGENCY	NUMBER
<p>Maintainability Program Plan</p> <p>3. DESCRIPTION/PURPOSE</p> <p>1. This plan describes how the Maintainability Program will be conducted. It describes the specific maintainability techniques and activities to be performed and their integration and development in conjunction with other specified related plans.</p> <p>2. This data item will serve any of the following purposes: (Continued)</p>	Army	DI-R-1740
<p>7. APPLICATION/INTERRELATIONSHIP</p> <p>1. This data item is provided to permit preparation of the Reliability, Maintainability, Quality or Assessment Programs by separate contractors when desirable. Cost, system integration, and method of contracting are prime considerations in preparation of a single DI-R-1700, Product Assurance Program Plan or separate coordinated plans.</p> <p>2. The data developed in accordance with this plan and the other Program Plans provide input to design/development engineering and maintenance engineering.</p> <p>3. This plan is required when there is a maintenance significance, which requires incorporation into design of the assurance of maintainability. (Continued)</p>	4. APPROVAL DATE 15 Dec 69	5. OFFICE OF PRIMARY RESPONSIBILITY USAMC
<p>10. PREPARATION INSTRUCTIONS</p> <p>1. The plan will outline the methods and techniques for incorporating maintainability into design and for conducting a comprehensive maintainability program in accordance with the contract scope of work or regulations and specifications as listed in the DD Form 1423. It will portray how maintainability will be achieved in sufficient detail to include schedule, technique, procedures, and responsibilities for each specific task.</p> <p>2. The Maintainability Plan must be appropriate and include but not necessarily limited to the following:</p> <p>The contractor's plan is first prepared in response to the RFP. The contractor will be expected to expand and modify the plan as necessary during this contract. The plan shall include the requirements of MIL-STD-470, 471, and 472. All plans shall identify action to be taken to assure maintainability if any material is to be developed elsewhere.</p> <p>3. The general format for the development of the Maintainability Program Plan is as follows:</p> <p>a. Program Summary. A summary shall be prepared to include cost scheduling inputs.</p>	6. DOC REQUIRED	8. APPROVAL LIMITATION
	<p>9. REFERENCES (Mandatory as cited in Block 10)</p> <p>AR 70-27 AR 705-5 AR 705-50 AMC Suppl 1 AMCR 750-15 MIL-STD-470 MIL-STD-471 MIL-HDBK-472 AMCP 706-134 AMCP 715-4 TM 38-700 Series 30470 50911</p>	

DI-R-1740

Description/Purpose (Continued)

a. The principle use is to provide a detailed description of a contractor's Maintainability Program to be accomplished under the contract of which the data item is a part. This use provides the procuring activity a basis for review of the contractor's progress and evaluation of his proposed techniques.

b. It may be used to describe how the material developer (Government) will conduct the life-cycle Maintainability Program for a material or system.

c. It may be used for a specific life-cycle phase of AR 11-25.

3. The plan assures a logical conduct of the Maintainability Program necessary for system development. It assures and verifies the accomplishment of maintainability necessary for the Integrated Logistics Support Program.

Application/Interrelationship (Continued)

4. Data items DI-R-1701 through 1704 may be specified separately or the maintainability portions included herein. When 1701-04, all or in part, are specified separately for visibility, significance, or cost effectiveness, than DI-R-1740 will only summarize briefly the time phasing and interrelationship of the separately detailed item to the program.

DI-R-1701 Product Assurance Test, Demonstration and Evaluation Plan
DI-R-1702 Product Assurance Design and Program Review Schedule
DI-R-1703 Product Assurance Design and Program Review Report
DI-R-1704 Product Assurance Failure Analysis and Corrective Action Reporting Plan
DI-R-1724 Quality Inspection Test, Demonstration and Evaluation Report
DI-S-1818 Maintenance Engineering Analysis

Preparation Instructions (Continued)

b. **Program Management and Control.** For a. activities and functional areas outline:

(1) Organization, responsibilities, internal assessment, contracting plans and control - Indicate method of liaison and communication to other programs. Contract plans should indicate subcontractor and vendor control.

DI-R-1740

Preparation Instructions (Continued)

(2) Design and Program Review. The review program will be conducted through review of Reports specified in DI-R-1741.

(3) Failure Analysis and Corrective Action Reporting. Reporting shall be as specified in DI-R-1734 and DI-R-1735.

c. Maintainability Activities and Functional Areas.

(1) Activities and Functional Areas -- Describe the procedures and which activities and functional areas will be used to achieve program objectives: Specification reviews, prediction, apportionment, component maintainability, failure effects and maintainability analysis design review, program review, storage effects, block diagrams, mathematical models, other performance analysis and maintainability goals if required, and planned method of accomplishment of maintainability parameters and characteristics.

d. Test and Demonstration Program. Indicate the test, demonstration, and evaluation program as described in MIL-STD-471 and DI-R-1701 or specify 1701 and only briefly interface herein. Provide evidence of integrating as feasible for cost effectiveness with other test demonstration and evaluations as specified.

DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)	
1. TITLE	AGENCY	NUMBER
3. DESCRIPTION/PURPOSE This report provides management with necessary information during development for evaluation and monitoring the Maintainability Program. During production, only major redesign will normally necessitate Maintainability Reports.	Army	DI-R-1741
7. APPLICATION/INTERRELATIONSHIP DI-R-1731, Reliability Reports DI-R-1732, Reliability Mathematical Model(s) DI-R-1740, Maintainability Program Plan This data item provides input to data items DI-R-1703, DI-R-1751, DI-R-1754, DI-R-1755 and DI-S-1812 and DI-S-1818 when they are specified.	4. APPROVAL DATE 15 Dec 69	
	5. OFFICE OF PRIMARY RESPONSIBILITY USAMC	
	6. DDC REQUIRED	
	8. APPROVAL LIMITATION	
10. PREPARATION INSTRUCTIONS 1. Reports shall be prepared and submitted in conformance with the Maintainability Plan, or as otherwise specified in the contract. These data may be presented as separate reports submitted intermittently as data is generated, or may be included in the regular periodic progress reports, whichever is specified on the DD Form 1423. 2. The reports shall contain all pertinent maintainability information and provide a complete account of progress for each task defined in the Maintainability Program Plan, results achieved, and status of actions to resolve major problems and correct weak tasks. Reports shall include charts or other illustrations comparing objectives, minimum requirements, predictions, and the level of achieved maintainability. Mathematical equations utilized and steps followed shall be included. 3. The following are the types of reports that may be required: a. Maintainability Progress Reports. These reports would list the significant accomplishments or problems occurring during the reporting period. b. The Maintainability Analysis Report shall include as a minimum but not limited to the following sections: (1) Resume of requirements (2) Apportionment models	9. REFERENCES (Mandatory as cited in block 10) MIL-STD-470 MIL-STD-471 MIL-STD-721 MIL-HDBK-472 AR 705-50 and AMC Suppl 1	
	MCSL NUMBER(S) 50440 50911	

DI-R-1741

Preparation Instructions (Continued)

- (3) Prediction models
 - (4) Assessment/Achievements (current account of observed values)
 - (5) Unresolved or anticipated maintainability problem areas or trends
 - (6) General maintainability design characteristics or attributes.
4. The Maintainability Analysis Report's format is not specified; however, the mixture of narrative vs. tabular data should be optimized toward the use of this report by design review teams and by personnel considering trade-off proposals, as well as a general status report.
5. The Maintainability Analysis Report is a periodic report and each issue of the report will be complete within itself. This report must satisfy the report requirements of paragraphs 5.2, 5.3, 5.4, 5.6 and 5.12 of MIL-STD-470.

DATA ITEM DESCRIPTION	2. IDENTIFICATION NO(S).	
1. TITLE	AGENCY	NUMBER
3. DESCRIPTION/PURPOSE	Army	DI-R-1742
<p>Maintainability Mathematical Model(s) is used to apportion maintainability requirements to various functions and/or levels of hardware within the total functions and/or levels of hardware within the total system, to predict the probability of the design meeting these requirements, and later for maintainability assessment.</p> <p>DI-R-1740, Maintainability Program Plan</p> <p>Maintainability Mathematical Model(s) shall utilize data from DI-S-1818, Maintenance Engineering Analysis when applicable.</p> <p>This data item may be integrated with Reliability Mathematical Model, DI-R-1732, into a single data item where feasible, for cost and administrative advantages.</p>	4. APPROVAL DATE	
	15 Dec 69	
	5. OFFICE OF PRIMARY RESPONSIBILITY	
	6. DDC REQUIRED	
7. APPLICATION/INTERRELATIONSHIP		5. APPROVAL LIMITATION
9. REFERENCES (Mandatory as cited in block 10)		MCSL NUMBER(S)
MIL-HDBK-472 MIL-STD-470 MIL-STD-471 AR 705-50 and AMC Suppl 1 TM 38-703 Series		50440 50911
10. PREPARATION INSTRUCTIONS		
<p>1. The Maintainability Mathematical Model(s) shall be developed to apportion maintainability requirements, predict design maintainability and to assess achieved maintainability. The mathematical model shall be supplemented by a maintainability block diagram of the system (or missions, functions, etc.). Where feasible a single mathematical model shall be prepared.</p> <p>2. The mathematical model will include the system/equipment elements through subassembly level unless otherwise specified in the contract.</p>		

DATA ITEM DESCRIPTION	2. IDENTIFICATION NO(S)	
1. TITLE	AGENCY	NUMBER
3. DESCRIPTION/PURPOSE	Army	DI-S-1800
7. APPLICATION/INTERRELATIONSHIP	4. APPROVAL DATE 15 Dec 69	
	5. OFFICE OF PRIMARY RESPONSIBILITY USAMC	
	6. DDC REQUIRED X	
	8. APPROVAL LIMITATION	
9. REFERENCES (Mandatory as cited in block 10) AR 70-31		
MCSL NUMBER(S)		
10. PREPARATION INSTRUCTIONS		
<p>Prepare documentation of the results of the efforts in technical reports specified on DD Form 1423 as follows:</p> <ol style="list-style-type: none"> 1. A letter progress report shall contain brief statements on the status of the project in accordance with the attached. 2. A final technical report shall formally document all efforts and results on the project and be delivered as specified on DD Form 1423. The format of the report depends on the nature of the work and in general the report shall contain: <ol style="list-style-type: none"> a. Aims and objectives. b. Positive and negative results of effort supported by significant data. c. Problems encountered and their solution. d. References used (Publication, lectures, conferences, reports, etc.) e. Calculations required for complete definition. f. Tables and charts of results and significant data. g. Other applicable data and calculations generated in the program. h. Photographs, drawings, etc. required for adequate description. i. Conclusions and recommendations. 		

DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)	
1. TITLE	AGENCY	NUMBER
System Feasibility/Special Studies Report	Army	DI-S-1806
3. DESCRIPTION/PURPOSE System Feasibility/Special Studies Report documents the system preliminary program or project definition and is used to correct deficiencies of original definition. These studies and reports are performed on demand to determine definitions at a specified time.	4. APPROVAL DATE 15 Dec 69	
	5. OFFICE OF PRIMARY RESPONSIBILITY USAMC	
	6. ODC REQUIRED	
	8. APPROVAL LIMITATION	
7. APPLICATION/INTERRELATIONSHIP	9. REFERENCES (Mandatory as cited in block 10) AMCR 11-16	
	MCSL NUMBER(S)	
10. PREPARATION INSTRUCTIONS A written report of findings and recommendations resulting from feasibility or special studies as indicated in contract scope of work shall be prepared.		

DATA ITEM DESCRIPTION		2 IDENTIFICATION NO(S).	
		AGENCY	NUMBER
1. TITLE Test and Demonstration Reports		Army	DI-T-1906
3. DESCRIPTION/PURPOSE Test reports document results of tests performed on systems, subsystems, equipments, components, and parts and provide engineering information for evaluation and determination of subsequent action.		4. APPROVAL DATE	
		5. OFFICE OF PRIMARY RESPONSIBILITY USAMC	
		6. OOC REQUIRED	
		8. APPROVAL LIMITATION	
7. APPLICATION/INTERRELATIONSHIP See DI-R-1724, Quality Inspection Test, Demonstration and Evaluation Report, engineering information acquired as a part of acceptance inspection of deliverable hardware.		9. REFERENCES (Mandatory as cited in block 10) AR 70-10 MIL-STD-831	
		MCSL NUMBER(S)	
10. PREPARATION INSTRUCTIONS Test reports shall contain all the collected data and all conclusions resulting from tests performed and shall be prepared in accordance with MIL-STD-831. Opinions and subjective conclusions must be clearly identified.			

DATA ITEM DESCRIPTION	2. IDENTIFICATION NO(S).	
1. TITLE	AGENCY	NUMBER
3. DESCRIPTION/PURPOSE This plan is required for determining and developing test procedures, sequence of testing, and schedules to be utilized in the testing of items, equipment, subsystems. The plan will provide a basis for establishment of a test program which will demonstrate the capability of an item, equipment or system to meet the requirements outlined in the contract and reflected in the total engineering requirements.	USAMC	DI-T-4905
7. APPLICATION/INTERRELATIONSHIP Data obtained from the test plan is used for initial design of a prototype. The plan may include the Human Factors Engineering tests described in DI-H-4606, Human Factors Engineering Test Program Plan.	4. APPROVAL DATE 1 April 1970	
	5. OFFICE OF PRIMARY RESPONSIBILITY HQUSMC (CS'Y)	
	6. ODC REQUIRED	
	8. APPROVAL LIMITATION	
10. PREPARATION INSTRUCTIONS The design or engineering test plan shall contain plans and procedures by which the capability of the item, equipment or system to accomplish operational requirements will be demonstrated. The plan shall describe the methods and techniques for obtaining data and shall establish and explain the standards, tests, associated analysis and other means that will constitute adequate proof upon completion of the testing that an acceptable level of performance can be achieved. The test plan will identify the tests to be conducted for determining compliance with the stated technical and operational military requirements and the specifications. The plan shall include but not be limited to, methods of test, schedules of performance, procedures for checkout, acceptance limits for performance capabilities, requirements and characteristics, description of test equipment, and a list of required Government equipment and facilities. The plan must demonstrate confidence that areas of coverage are adequate and that data generated will assure that the objectives of performance can be validated. The plan must be submitted for Government approval prior to the beginning of any testing. Maximum use of Government owned facilities and instrumentation will be stipulated.	9. REFERENCES (Mandatory as cited in Block 10)	
	MCSL NUMBER(S)	

DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)	
	AGENCY	NUMBER
1. TITLE Briefing Charts	NSA	A-5020
3. DESCRIPTION/PURPOSE For conveying information to persons participating in conferences, meetings, symposia, etc.	4. APPROVAL DATE 1 Oct 67	
	5. OFFICE OF PRIMARY RESPONSIBILITY N	
	6. DOC REQUIRED N/A	
	8. APPROVAL LIMITATION	
7. APPLICATION/INTERRELATIONSHIP	9. REFERENCES (Mandatory as cited in block 10)	
	MCSL NUMBER(S)	
10. PREPARATION INSTRUCTIONS		
<p>1. The contractor shall furnish briefing charts & handouts on the subject(s) and in the quantity designated in the respective Block 15 of the DD Form 1423 wherein this data item is listed as a technical data requirement.</p> <p>2. The charts shall be prepared as indicated below to convey information normally needed during the design stages of development:</p> <ul style="list-style-type: none"> a. Charts shall be suitable for briefings in an area no: larger than 400 square feet. b. Each chart shall be prepared on 30" x 40" bristol board of sufficient quality to avoid bleeding when written information is added. c. Information entered thereon shall not be less than one inch in height and of sufficient density to be visible without blurring from a distance of twenty feet. d. Space between lines on the body of the chart shall be no less than the height of the letters used to prepare the charts. 		

A-5020

Preparation Instructions (Continued)

3. Briefing Handout – Demonstration

The contractor shall furnish briefing handouts in the quantities specified. The briefing handouts shall be prepared on 8 x 10½ paper suitable for distribution and contain not less than the following:

- a. Brief description of the item
- b. Agenda
- c. Photograph of the item

4. Briefing Brouchre – Formal Briefing

The contractor shall furnish a brochure, the quantities specified. The briefing shall be prepared on 8 x 10½ paper suitable for distribution and contain not less than the following:

- a. Summary of work accomplished
- b. Test results
- c. Conclusions and recommendations

DATA ITEM DESCRIPTION		2 IDENTIFICATION NO(S)	
		AGENCY	NUMBER
1. TITLE Demonstration and Acceptance Plan			NSA S-5138
3. DESCRIPTION/PURPOSE Define the requirements to be met at the system demonstration exercises.	4. APPROVAL DATE 1 Oct 67		
	5. OFFICE OF PRIMARY RESPONSIBILITY N		
	6. DDC REQUIRED N/A		
	8. APPROVAL LIMITATION		
7. APPLICATION/INTERRELATIONSHIP Establishes a basis for demonstrations and acceptance schedules.	9. REFERENCES (Mandatory as cited in block 10)		
	MCIL NUMBER(S)		
10. PREPARATION INSTRUCTIONS The contractor shall prepare a demonstration plan which will define the requirements to be met at the system demonstration exercise. The plan shall include, but need not be limited to, the following: <ul style="list-style-type: none"> a. Objectives of the demonstration. b. Identification of technical data required. c. Identification of the performance and equipment specification requirements subject to demonstration. d. Support requirements of the contractor that must be supplied by the Government (facilities and housekeeping). 			

Appendix 3

Contract Data Requirements List

ATON NO. TO COMBAT		CONTRACT DATA REQUIREMENTS LIST		SYSTEM ITEM Parachute Retrorocket		
TO CONTRACTOR/PR		CATEGORY Administrative/Management		CONTRACTOR Airtro Systems		
1. SEQUENCE NUMBER	2. TITLE OR DESCRIPTION OF DATA	3. SUBTITLE	4. CONTRACT REFERENCE	5. TECHNICAL OFFICE	6. FREQUENCY	
7. AUTHORITY (State Dept Number)	8. CONTRACT REFERENCE	9. DATE OF DATE	10. DATE OF SUBMISSION	11. DATE OF SUBMISSION	12. DATE OF SUBMISSION	
13. REMARKS	14. REMARKS	15. REMARKS	16. REMARKS	17. REMARKS	18. REMARKS	
1	Still Photographic Records	AMXRE-AAS ASBEO	AMXRE-AAS ASBEO	CG USANLABS Natick MA 01760 ATTN: AMXRE-AAS	1 NEG/2 prints of each photo- graph	CG USANLABS Natick MA 01760 ATTN: AMXRE-AAS
2	Motion Picture Film Records	AMXRE-AAS ASBEO	AMXRE-AAS ASBEO	CG USANLABS Natick MA 01760 ATTN: AMXRE-AAS	1. Approx. TOTAL 2000 ft	CG USANLABS Natick MA 01760 ATTN: AMXRE-AAS
3	Documentary	AMXRE-AAS ONE/P	AMXRE-AAS ONE/P	CG USANLABS Natick MA 01760 ATTN: AMXRE-AAS	TOTAL 800 ft	CG USANLABS Natick MA 01760 ATTN: AMXRE-AAS
4	Progress/Status Meeting Report	AMXRE-AAS	AMXRE-AAS	CG USANLABS Natick MA 01760 ATTN: AMXRE-AAS	15 days after meet	CG USANLABS Natick MA 01760 ATTN: AMXRE-AAS
5	Meetings to be initiated at request of Project Engineer. Approximately ten (10) such meetings will be held.			CG USANLABS Natick MA 01760 ATTN: AMXRE-AAS	TOTAL A/2A	CG USANLABS Natick MA 01760 ATTN: AMXRE-AAS

DD FORM 1423
1 JUN 65

REPLACES EDITION OF 1 APR 59, WHICH IS OBSOLETE.

PAGE 1 OF 2 PAGES

17. CONTRACTOR FULL/	22. CONTRACTOR FULL/
18. CONTRACTOR APPROVAL	23. CONTRACTOR APPROVAL
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ATTN MR _____ TO EXHIBIT _____		CONF. & AC DATA REQUIREMENTS LIST		SYSTEMS/ITEM _____		CONTRACTOR _____	
TO CONTRACTOR / P/R _____		CATEGORY _____		ADMINISTRATIVE / ASSIGNMENT _____		PARACHUTE RETROCKET AIRDROP SYSTEM	
1. SEQUENCE NUMBER	2. TITLE OR DESCRIPTION OF DATA	3. TECHNICAL OFFICE	4. FREQUENCY	5. DATE OF 1ST SUBMISSION	6. DISTRIBUTION AND ADDRESSES (Address - Regular Copies/Repro Copies)	7. ESTIMATED TOTAL PRICE	8. CONTRACT VALUE
9. SUBTITLE	10. CONTRACT REFERENCE	11. ROOM (See Remarks)	12. AS OF DATE	13. DATE OF SUBSEQUENT SUBM./EVENT ID	14. CONTRACTOR	15. ESTIMATED TOTAL PRICE	16. CONTRACT VALUE
17. AULT ID	18. CITY (State Room Number)	19. ROOM (See Remarks)	20. AS OF DATE	21. DATE OF SUBSEQUENT SUBM./EVENT ID	22. CONTRACTOR	23. ESTIMATED TOTAL PRICE	24. CONTRACT VALUE
5	Briefing Charts	AMXRE-AAS	ONE/P	240 DAC	CG USN LABS 10/0 Natick, MA		
DI-A-5020							
REMARKS							
* To be available for system demonstration							
* Sketches on 28x32 white bond easel paper for gov't approval. 15 DA for gov't review. Final charts due 30 DA approval							
6	Briefing Charts	AMXRE-AAS	OTIME	240 DAC	CG USAN LABS 4/1 Natick, MA		
DI-A-5020							
REMARKS							
* To be available for system demonstration							
7	Briefing Charts	AMXRE-AAS	*		CG USAN LABS 4 (draft) Natick, MA		
DI-A-5020							
REMARKS							
* The contractor shall submit a draft copy 60 days before end of contract. 30 days required for gov't review and approval. Final copies due 30 days after gov't approval							
PREPARED BY _____		DATE _____		APPROVED BY _____		DATE _____	

17. EVENT/EXI NUMBER	18. SUB APPROVAL / OTHER NUMBER	19. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.	23. CONTRACTOR P/R/ ESTIMATED PRICE
19. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.	23. CONTRACTOR P/R/ ESTIMATED PRICE		

ATOM NR		TO EXHIBIT		CONTRACT DATA REQUIREMENTS LIST		SYSTEM ITEM		Parachute Retrorocket	
TO CONTRACT/PR		CA' EGORY		Human Factors		CONTRACTOR:		Airdrop-System	
SEQUENCE NUMBER	TITLE OR DESCRIPTION OF DATA	TECHNICAL OFFICE	FREQUENCY	DATE OF 1ST SUBMISS	DISTRIBUTION AND ADDRESSES	CONTRACT REFERENCE	DATE OF SUBS JURY	ESTIMATE NUMBER	CONTRACTOR FILE/INVENTORY NUMBER
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
AUTHORITY (Dow-4 from Phase 1)	3.	7.	8.	9.	10.	11.	12.	13.	14.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1	Human Factors Engineering Plan	AMXRE-AAS	ONE/R	30 DAC	CG LISANLABS Natick, MA				
DI-H-1312					01760 Atto: AMXRE-AAS				
** To be updated as necessary. Four (4) copies of plan required.									
2	Human Factors Engineering Progress Report	AMXRE-AAS							
DI-H-1314		LT							
** To be submitted with DI-S-1800 (Progress Report)									
3	System Safety Program Plan	AMXRE-AAS	ONE/R	30 DAC	CG LISANLABS Natick, MA				
DI-H-1320A					01760 Atto: AMXRE-AAS				
** To be updated as necessary. Four (4) copies of plan required.									
4	Safety Statement	AMXRE-AAS	OTIME						
DI-H-1372A			240 DAC						
REMARKS									
PREPARED BY									
DATE									
APPROVED BY									

17. EVENT/ISSUE NUMBER	18. CONTRACTOR FILE/INVENTORY NUMBER
19. 20. 21.	22. 23. 24.
25. 26. 27.	28. 29. 30.
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91. 92. 93.	94. 95. 96.
97. 98. 99.	100. 101. 102.
CONTRACT VALUE	

DD FORM 1326A TO EXHIBIT		CONTRACT DATA REQUIREMENTS LIST		SYSTEM/ITEM		CONTRACTOR	
TO CONTRACT/PR		CATEGORY		Human Factors		Parachute Retrorocket Airdrop System	
1. SEQUENCE NUMBER	2. TITLE OR DESCRIPTION OF DATA	3. CONTRACT REFERENCE	4. TECHNICAL OFFICE	5. DATE OF SUBMISSION	6. DISTRIBUTION AND ADDRESSES	7. ESTIMATED TOTAL PRICE	8. CONTRACT VALUE
10. AUTHORITY (Date Issue Number)	11. CONTRACT REFERENCE	12. DATE OF SUBMISSION	13. DATE OF SUBMISSION	14. DATE OF SUBMISSION	15. DATE OF SUBMISSION	16. DATE OF SUBMISSION	17. DATE OF SUBMISSION
18. REMARKS	19. REMARKS	20. REMARKS	21. REMARKS	22. REMARKS	23. REMARKS	24. REMARKS	25. REMARKS
5	DI-H-1326A Safety Analyses and Hazard Evaluation Report Preliminary Hazard Analysis	AMXRE-AAS OTIME LT A 90 DAC	AMXRE-AAS LT A	End of Contract	CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS	4/0	
6	DI-H-1326A Safety Analysis and Hazard Evaluation Report Operational Safety Analysis	AMXRE-AAS R/ASR LT A 180 DAC	AMXRE-AAS LT A	End of Contract	CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS	4/0	
7	DI-H-1326A Safety Analysis and Hazard Evaluation Report	AMXRE-AAS R/ASR LT A 180 DAC	AMXRE-AAS LT A	End of Contract	CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS	4/0	
8	DI-H-1326A System Analysis and Hazard Evaluation Report Maintenance Hazard Analysis	AMXRE-AAS R/ASR LT A 180 DAC	AMXRE-AAS LT A	End of Contract	CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS	4/0	

DD FORM 1326A 1 JUN 68 1423

REPLACES EDITION OF 1 APR 68, WHICH IS OBSOLETE.

17. EVENT/FILE NUMBER	18. CONTRACTOR FILE/DOCUMENT NUMBER	19. CONTRACTOR FILE/DOCUMENT NUMBER	20. CONTRACTOR FILE/DOCUMENT NUMBER	21. CONTRACTOR FILE/DOCUMENT NUMBER	22. CONTRACTOR FILE/DOCUMENT NUMBER
17.1	18.1	19.1	20.1	21.1	22.1
17.2	18.2	19.2	20.2	21.2	22.2
17.3	18.3	19.3	20.3	21.3	22.3
17.4	18.4	19.4	20.4	21.4	22.4
17.5	18.5	19.5	20.5	21.5	22.5
17.6	18.6	19.6	20.6	21.6	22.6
17.7	18.7	19.7	20.7	21.7	22.7
17.8	18.8	19.8	20.8	21.8	22.8
17.9	18.9	19.9	20.9	21.9	22.9
17.10	18.10	19.10	20.10	21.10	22.10
17.11	18.11	19.11	20.11	21.11	22.11
17.12	18.12	19.12	20.12	21.12	22.12
17.13	18.13	19.13	20.13	21.13	22.13
17.14	18.14	19.14	20.14	21.14	22.14
17.15	18.15	19.15	20.15	21.15	22.15
17.16	18.16	19.16	20.16	21.16	22.16
17.17	18.17	19.17	20.17	21.17	22.17
17.18	18.18	19.18	20.18	21.18	22.18
17.19	18.19	19.19	20.19	21.19	22.19
17.20	18.20	19.20	20.20	21.20	22.20
17.21	18.21	19.21	20.21	21.21	22.21
17.22	18.22	19.22	20.22	21.22	22.22
17.23	18.23	19.23	20.23	21.23	22.23
17.24	18.24	19.24	20.24	21.24	22.24
17.25	18.25	19.25	20.25	21.25	22.25
17.26	18.26	19.26	20.26	21.26	22.26
17.27	18.27	19.27	20.27	21.27	22.27
17.28	18.28	19.28	20.28	21.28	22.28
17.29	18.29	19.29	20.29	21.29	22.29
17.30	18.30	19.30	20.30	21.30	22.30
17.31	18.31	19.31	20.31	21.31	22.31
17.32	18.32	19.32	20.32	21.32	22.32
17.33	18.33	19.33	20.33	21.33	22.33
17.34	18.34	19.34	20.34	21.34	22.34
17.35	18.35	19.35	20.35	21.35	22.35
17.36	18.36	19.36	20.36	21.36	22.36
17.37	18.37	19.37	20.37	21.37	22.37
17.38	18.38	19.38	20.38	21.38	22.38
17.39	18.39	19.39	20.39	21.39	22.39
17.40	18.40	19.40	20.40	21.40	22.40
17.41	18.41	19.41	20.41	21.41	22.41
17.42	18.42	19.42	20.42	21.42	22.42
17.43	18.43	19.43	20.43	21.43	22.43
17.44	18.44	19.44	20.44	21.44	22.44
17.45	18.45	19.45	20.45	21.45	22.45
17.46	18.46	19.46	20.46	21.46	22.46
17.47	18.47	19.47	20.47	21.47	22.47
17.48	18.48	19.48	20.48	21.48	22.48
17.49	18.49	19.49	20.49	21.49	22.49
17.50	18.50	19.50	20.50	21.50	22.50

ATCH NR		TO EXHIBIT		CONTRACT DATA REQUIREMENTS LIST		SYSTEM/ITEM		Parachute Retrorocket	
TO CONTRACT/PR		CATEGORY		Related Design Requirements		CONTRACTOR		Alidrop System	
1. SEQUENCE NUMBER	2. TITLE OR DESCRIPTION OF DATA	3. SUBTITLE	4. CONTRACT REFERENCE	5. TECHNICAL OFFICE	6. FREQUENCY	7. DATE OF 1ST SUBMISSION	8. DATE OF SUBSEQUENT SUBM/TEST IS	9. DISTRIBUTION AND ADDRESSES (Addresser - Regular Copies/Specs Copies)	10. CONTRACTOR
1	Product Assurance Test, Demonstration and Evaluation Plan			AMXRE-AAS	R/ASR			CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS	4/0
DI-R-1701									
REMARKS									
* To be submitted concurrent with Data Item Number DI-T-4905.									
2	Reliability Program Plan			AMXRE-AAS	ONE/R	30 DAC		CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS	4/0
DI-R-1730									
REMARKS									
* To be updated as required.									
3	Reliability Reports			AMXRE-AAS					
DI-R-1731									
REMARKS									
* To be submitted with Data Item DI-S-1800 (Progress Report)									
4	Reliability Mathematical Model(s)			AMXRE-AAS	R/ASR	120 DAC		CG USANLABS Natick, MA 01760 Attn: AMXRE-PAS	4/0
DI-R-1732									
REMARKS									
PREPARED BY									
DATE									
APPROVED BY									

17. EVENT/ACI NUMBER	18. CONTRACTOR FILE/ DOCUMENT NUMBER	19. ESTIMATED NUMBER OF PAGES	20. PRICE GROUP
17. 18. 19. 20. 21. 22. FOR ADP			
17. 18. 19. 20. 21. 22. RESERVE			
17. 18. 19. 20. 21. 22. ESTIMATED TOTAL PRICE			
17. 18. 19. 20. 21. 22. CONTRACT VALUE			

17. EVENT/ACT NUMBER	23. CONTRACT FILE/ DOCUMENT NUMBER
18. FOR APPROVAL / ACT NUMBER	24. CONTRACT NUMBER
19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32.	33. ESTIMATED TOTAL PRICE
CONTRACT VALUE	

ATTACH NR TO EXHIBIT		CONTRACT DATA REQUIREMENTS LIST		SYSTEM/ITEM/Aircraft System		CONTRACTOR		DISTRIBUTION AND ADDRESSEES	
SEQUENCE NUMBER	TITLE OR DESCRIPTION OF DATA	TECHNICAL OFFICE SYMBOL	FREQUENCY	DATE OF 1ST SUBMISSION	DATE OF SUBSEQUENT SUBMISSION	CONTRACT REFERENCE	CONTRACTOR	ADDRESS - Regular Copies/Airframe Config	DATE
5	Reliability Qualified Items List DI-R-1733	AMXRE-AAS	R/ASR	180 DAC			CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS	4/0	
14. REMARKS									
6	Reliability Failure Modes, Effects & Criticality Analysis Report DI-R-1734	AMXRE-AAS	R/ASR	180 DAC			CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS	4/0	
14. REMARKS									
7	Reliability Failed Item Analysis Report DI-R-1735	AMXRE-AAS	ASREQ				CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS	4/0	
14. REMARKS Report to be submitted for each major component subsystem and system. Within two (2) weeks of item failure.									
8	Maintainability Program Plan DI-R-1740	AMXRE-AAS	ONE/R	30 DAC			CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS	4/0	
14. REMARKS * To be updated as required.									
PREPARED BY		DATE		APPROVED BY					

ATTN NR _____ TO EXHIBIT _____		CONTRACT DATA REQUIREMENTS LIST		SYSTEM ITEM _____		CONTRACTOR _____	
TO CONTRACT/PR		CATEGORY Related Design Requirement		DISTRIBUTION AND ADDRESSES (address--Regular Copies/Supp Copies)			
1. SEQUENCE NUMBER	2. TITLE OR DESCRIPTION OF DATA	3. SUBTITLE	4. CONTRACT REFERENCE	5. TECHNICAL OFFICE SYMBOL (Case File No. 1-1) (S)	6. DATE OF SUBMISSION	7. DATE OF SUBMISSION SIGN/EVENT ID	8. TOTAL
9	Maintainability Reports			AMXRE-AAS L.T.			
DI-R-1741							
* To be submitted with Data Item DI-S-1800 (Progress Report)							
10	Maintainability Mathematical Model (S)			AMXRE-AAS L.T.	120.DAC		
DI-R-1742							
CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS							
							15. TOTAL 4/0
16. REMARKS							
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DD FORM 1423
1 JUN 66

REPLACES EDITION OF 1 APR 66, WHICH IS OBSOLETE.

17. EVENT/CI NUMBER	18. CONTRACTOR FILE/ DOCUMENT NUMBER
19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.	
ESTIMATED TOTAL PRICE	
CONTRACT VALUE	

1. CONTRACT NUMBER	2. TITLE OF CONTRACT	CONTRACT DATA REQUIREMENTS LIST					13. DATE OF 1ST SUBMISSION	14. DISTRIBUTION AND ADDRESSES (Address - Regular Copies/Response Copies)	17. SYSTEM/ITEM
		3. SUB TITLE	4. AUTHORITY (Order Number)	5. CONTRACT REFERENCE	6. TECHNICAL OFFICE SYMBOLS (1-1, 1-2, 1-3, 1-4)	7. FREQUENCY AS OF DATE			
DI-S-1800	Parachute Retrorocket Airlock-Up System						CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS		
1. Technical Reports	1. Letter Progress Report	AMXRE-AAS	MTHLY	0	15 Days after end of each month	TOTAL 4/0	CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS		
2. Technical Reports	2. Final Report	AMXRE-AAS	A			TOTAL 4/1	CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS		
3. System Feasibility/Special Study Report	3. Operational Utilization Study	AMXRE-AAS	A				CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS		
4. System Feasibility/Special Study Report	4. Economic and Logistic Study	AMXRE-AAS	A				CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS		

17. SYSTEM/ITEM	18. CONTRACT VALUE	19. ESTIMATE NUMBER	20. CONTRACT NUMBER	21. ESTIMATE NUMBER	22. ESTIMATE PRICE
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ATCH-NR TO EXHIBIT		CONTRACT DATA REQUIREMENTS LIST		SYSTEM/ITEM		CONTRACTOR	
TO CONTRACT/PR		CATEGORY		SUBSYSTEM		CONTRACTOR	
1. SOURCE NUMBER	2. TITLE OR DESCRIPTION OF DATA	3. CONTRACT REFERENCE	4. TECHNICAL OFFICE	5. DATE OF 1ST SUBMISSION	6. DISTRIBUTION AND ADDRESSEES	7. CONTRACTOR FILE/ CONTRACT NUMBER	8. ESTIMATED NUMBER OF PAGES
9. AUTHORITY (Data from Numbers)	10. CONTRACT REFERENCE	11. AS OF DATE	12. DATE OF SUBSEQUENT SUBMISSION	13. DATE OF SUBSEQUENT SUBMISSION	14. ADDRESS - Regular Contract (See Caption)	15. ESTIMATED TOTAL PRICE	16. PRICE GROUP
5	System Feasibility/Special Study Report 1. Trade-Off Analysis	AMXRE-AAS	AMXRE-AAS		CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS		
DI-S-1806							
REMARKS * Draft report to be submitted for approval prior to finalizing any component design. Final study to be submitted with DI-S-1800 (Final Report).							
6	System Feasibility/Special Study Report 1. Sensitivity Analysis	AMXRE-AAS	AMXRE-AAS		CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS		
DI-S-1806							
REMARKS * Draft report to be submitted for approval prior to finalizing any component design. Final study to be submitted with DI-S-1800 (Final Report).							
7	System Feasibility/Special Study Report 1. Drop Zone Altitude Effects	AMXRE-AAS	AMXRE-AAS		CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS		
DI-S-1806							
REMARKS * To be submitted with DI-S-1800 (Final Report)							
8	Demonstration and Acceptance Plan	AMXRE-AAS	AMXRE-AAS		CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS		
DI-S-5138							
REMARKS Contractor to furnish a draft plan 30 days prior to the demonstration. 15 days required for gov't approval. Final plan to be submitted 15 days after gov't approval.							
PREPARED BY				DATE		APPROVED BY	

DD FORM 1423
REPLACES EDITION OF 1 APR 60, WHICH IS OBSOLETE.
PAGE 2 OF 2 PAGES

17. EVENT/ELI NUMBER	18. CONTRACTOR FILE/ CONTRACT NUMBER	19. ESTIMATED NUMBER OF PAGES	20. PRICE GROUP
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ATCH NR		TO EXHIBIT		CONTRACT DATA REQUIREMENTS LIST		SYSTEM/ITEM		CONTRACTOR		Parachute Retrorocket	
TO CONTRACT/PR		CATEGORY		Test						Aircoop System	
1. REQUIRE NUMBER	2. TITLE OR DESCRIPTION OF DATA	3. AUTHORITY (Data Form Number)	4. CONTRACT REFERENCE	5. TECHNICAL OFFICE SYMBOL (1-3)	6. FREQUENCY AS OF DATE	7. DATE OF SUBMISSION	8. DISTRIBUTION AND ADDRESSES (Address - Regular Copy/Items Copies)	9. ESTIMATED TOTAL PRICE	10. CONTRACT VALUE	11. CONTRACTOR FILE/PROJECT NUMBER	12. NUMBER OF PAGES
1	DI-T-1906		Test and Demonstration Reports	AMXRE-AAS LT	ASREQ	30 days after event	CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS	4/0			
2	DI-T-4905		Design or Engineering Test Plan(s)	AMXRE-AAS LT A	ASREQ		CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS	4 (Draft)			
REMARKS Contractor shall submit draft copy 80 days before planned conduct of test. 15 days required for Government approval. Final plan due 15 days after Government approval.											
TOTAL 4/0											
TOTAL 4/1											
CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS											
TOTAL											
CG USANLABS Natick, MA 01760 Attn: AMXRE-AAS											
TOTAL											
DATE											

DD FORM 1423
1 JUN 68
REPLACES EDITION OF 1 APR 68, WHICH IS OBSOLETE.

17. CONTRACT VALUE	18. CONTRACTOR FILE/PROJECT NUMBER
19. EST. TOTAL PRICE	20. NUMBER OF PAGES
21. CONTRACT VALUE	22. CONTRACTOR FILE/PROJECT NUMBER
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25. CONTRACT VALUE	26. CONTRACTOR FILE/PROJECT NUMBER
27. EST. TOTAL PRICE	28. NUMBER OF PAGES
29. CONTRACT VALUE	30. CONTRACTOR FILE/PROJECT NUMBER
31. EST. TOTAL PRICE	32. NUMBER OF PAGES
33. CONTRACT VALUE	34. CONTRACTOR FILE/PROJECT NUMBER
35. EST. TOTAL PRICE	36. NUMBER OF PAGES
37. CONTRACT VALUE	38. CONTRACTOR FILE/PROJECT NUMBER
39. EST. TOTAL PRICE	40. NUMBER OF PAGES
41. CONTRACT VALUE	42. CONTRACTOR FILE/PROJECT NUMBER
43. EST. TOTAL PRICE	44. NUMBER OF PAGES
45. CONTRACT VALUE	46. CONTRACTOR FILE/PROJECT NUMBER
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49. CONTRACT VALUE	50. CONTRACTOR FILE/PROJECT NUMBER
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69. CONTRACT VALUE	70. CONTRACTOR FILE/PROJECT NUMBER
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77. CONTRACT VALUE	78. CONTRACTOR FILE/PROJECT NUMBER
79. EST. TOTAL PRICE	80. NUMBER OF PAGES
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93. CONTRACT VALUE	94. CONTRACTOR FILE/PROJECT NUMBER
95. EST. TOTAL PRICE	96. NUMBER OF PAGES
97. CONTRACT VALUE	98. CONTRACTOR FILE/PROJECT NUMBER
99. EST. TOTAL PRICE	100. NUMBER OF PAGES

Appendix 4
Procurement/Work Directive to Harry Diamond Labs
Development of a Ground Sensor

PROCUREMENT/WORK DIRECTIVE (AMCR 11-15)				1. TRANSMITTAL CONTROL NUMBER	2. PAGE 1 OF 2 PAGES	3. PRIORITY											
4. TO: Harry Diamond Laboratories ATTN: AMXDO-OCA-DB Wash, DC 20438				5. APPROVED BY:	6. BASIC FACT CODE:	7. DATE											
6. FROM: CG, U.S. Army Natick Laboratories ATTN: AMXRED-CP Natick, Mass. 01760				8. AUTHORIZED BY:	10. PROJECT NO./CATEGORY CODE: 1F163209DB33												
11. CMS TITLE/ITEM NOMENCLATURE: Airdrop Equipment (Adv Dev)				12. CUSTOMER ORDER NUMBER:	13. PRON:												
14. AMCRS CODE:		15. ACCOUNTING CLASSIFICATION:			16. DATE OIBP:												
17. QUANTITY ON ORDER:		18. TARGET DATE FOR OBLIGATION:		19. LOCAL USE:													
20. QUANTITATIVE AND CHANGE DATA																	
ELEMENT	U/1	QUANTITY	UNIT PRICE	TOTAL PRICE													
a. PRIOR																	
b. TOLERANCE USED																	
c. INCREASE																	
d. DECREASE																	
e. CURRENT																	
f. TOLERANCE																	
21. REPORT CODE:			22. TYPE OF FINANCING:														
23. DESCRIPTION OF WORK AUTHORIZED/SPECIAL INSTRUCTIONS/INCLOSURES:																	
<p>1. (a) The work to be performed shall include research, development, test and evaluation, and the furnishing of test ground sensor units to NLABS during the advanced development of the Parachute Retrorocket Airdrop Systems. The scope of work shall be in accordance with the Stencil Aero Engineering Corporation Technical Data Document No. S67409-004 entitled Altitude Sensor Parachute Retrorocket Airdrop System to NLABS Revision B dated 21 October 1971. Harry Diamond Laboratories' letter to NLABS dated 12 August 1971, subject: Ground Sensor for PRADS, P-14-393 with inclosure entitled, A Proposal for the Development of an Active Optical Sensor for PRADS, and HDL letter to NLABS dated 20 September 1971, subject: PRADS Sensor Meeting, 8-9 September 1971.</p> <p>(b) Harry Diamond Laboratories shall provide engineering and technician support at the drop test site.</p> <p>(c) Harry Diamond Laboratories shall provide visual aids and technical representatives in support of briefings as may be required during the Advanced Development Phase.</p> <p>(d) During the Advanced Development Phase, changes in details of the design, or scope of work may be required to improve the design, to reduce the cost, to achieve essential compatibility with other components such as the parachute system and the rocket pack, to meet Air Force flight safety requirements and for other possible reasons in the best interest of this project.</p> <p>(e) The Harry Diamond Laboratories will have responsibility for development of the ground sensor. Frankford Arsenal will have responsibility for the rocket motor. A systems control will have responsibility for the entire system. Close coordination will be required between the Government agencies and the systems contractor. NLABS will have overall responsibility.</p> <p>(1) The choice of and design of the optical ground sensor shall be the responsibility of the Harry Diamond Laboratories. However, the design of the optical ground sensor shall be coordinated with the systems contractor.</p>																	
24. PACKAGING, PACKING, AND MARKING SHALL BE IN ACCORDANCE WITH:																	
25. DISTRIBUTION PATTERN:				BASIC FACT CODE:		STOCK NUMBER:											
4. DEPT	DOC IDENT	R1 FROM	M & S	U/1	QTY	CUST DOC NUMBER:	S U F	SUPPL ADDRESS	S I O	P A C	DIST	PROJ	PO	ROD	A O V	WGT DATA	UNIT PRICE
UNIT PACK:		INTER PACK:		CONSIGNEE:				83									
P & P LEVEL:		PACKING LEVEL:															

CONTINUATION OR SUPPORTING SHEET <small>(AMCR 11-2)</small>	PAGE	OF	PAGES	DATE
	2	2	2	
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(2) Design sketches or drawings of all breadboard components of the ground sensor and a description of how it operates as well as preliminary prototype design drawings of the ground sensor will be submitted to the systems contractor for written approval of its application to validate fit, form and function with PRADS before they are finalized. Copies of all material sent to the systems contractor will be furnished to the Natick Laboratories Project Officer.

(f) The Harry Diamond Laboratories shall prepare a complete reliability study and develop a reliability mathematical model including a reliability block diagram to apportion reliability requirements and submit an analytical reliability study.

(g) The Harry Diamond Laboratories shall develop a Product Assurance Test Demonstration and Evaluation Plan defining the requirements for Reliability/Maintainability, Quality and Performance Assessment. The plan shall encompass detailed requirements for a comprehensive test demonstration and evaluation and shall include:

- (1) Scheduled and detail description of test demonstration/evaluation to be reported upon.
- (2) List of Proposed reliability testing.
- (3) Requirement for specific types and degrees of testing based on Reliability and Maintainability Mathematical Models.

(h) The Harry Diamond Laboratories shall furnish a Technical Data Package at the conclusion of the advanced Development Phase compatible with MIL-STD-100, MIL-STD-490, MIL-D-1000 and MIL-S-83490.

(i) The Harry Diamond Laboratories shall develop a Maintainability Mathematical Model including a supporting block diagram to apportion maintainability requirements, to predict design maintainability and to assess achieved maintainability.

NOTE: This project order is for the FY-72 Advanced Development Phase only. The work effort to be performed in FY-73 will be authorized when FY-73 funds become available.

2. Reports Required: (a) Monthly Letter Progress Report – Five (5) copies of a letter Progress Report shall be furnished within 45 days of acceptance of this project order and by the 15th day of each month thereafter. **These reports shall indicate progress made, special problems or events, conclusions, actions proposed for the next period, percentage of work completed and the percentage costs incurred at end of the period being reported.** (b) Final Report – Four (4) copies of a draft final report prepared in accordance with Appendix A of NLABS Reg 70-16 shall be submitted for approval within 30 days after completion of the advanced Development Phase. One copy of the final report in reproducible form shall be furnished in accordance with NLABS Reg 70-16, within 30 days after receipt of the approved draft together with one collated copy of the final report.

Appendix 5
Procurement/Work Directive to Frankford Arsenal
for Development of a Rocket Motor

PROCUREMENT/WORK DIRECTIVE <i>(AMCR 11-15)</i>				1. TRANSMITTAL CONTROL NUMBER		2. PAGE 1 OF 2 PAGES		3. PRIORITY										
4. TO: CO, Frankford Arsenal, Phila, Pa. ATTN: SMUFA-F5310/SMUFA-J5100				5. APPROVED BY:		6. BASIC FACT CODE:		7. DATE										
8. FROM: CG, U.S. Army Natick Laboratories Natick, Mass. 01760 ATTN: AMX.RED-CP				9. AUTHORIZED BY:		10. PROJECT NO./CATEGORY CODE: 1F163209DB33												
11. CMB OFFICE/REP NOMENCLATURE: Airdrop Equipment (Adv Dev)				12. CUSTOMER ORDER NUMBER:		13. PROJ:												
14. AMCR CODE:			15. ACCOUNTING CLASSIFICATION:			16. DATE DISP:												
17. QUANTITY ON ORDER:			18. TARGET DATE FOR OBLIGATION:			19. LOCAL USE:												
20. QUANTITATIVE AND CHANGE DATA																		
ELEMENT		U/M	QUANTITY	UNIT PRICE		TOTAL PRICE												
g. PRIOR																		
h. TOLERANCE USED																		
i. INCREASE																		
j. DECREASE																		
k. CURRENT																		
l. TOLERANCE																		
21. REPORT CODE:				22. TYPE OF FINANCING:														
23. DESCRIPTION OF WORK AUTHORIZED/SPECIAL INSTRUCTIONS/INCLOSURES:																		
<ol style="list-style-type: none"> 1. Reference SMUFA-J5100 letter dated 17 June 71 to USANLABS, subject: PRADS Program Planning. 2. <ol style="list-style-type: none"> (a) Perform work effort detailed in reference letter proposal above. (b) Provide engineering and technician support at the drop test site. (c) The technical data specifications outlined in "Rocket Motor - Parachute Retrorocket Airdrop System", Document No. 567409 dated 11 April 1968. Revision E shall be used as a basis for the design of the rocket motor. All drawings shall be in accordance with MIL-D-1000 Category E. Form 1. (d) During the Advanced Development Phase, changes in details of the design or scope of work may be required to improve the design, reduce cost, to assure improved compatibility with the other components such as the ground sensor and rocket pack, to meet Air Force flight safety requirements and for other possible reasons in the interest of this project. (e) Submit a full environmental and field test program within the first few months to NLABS for comment prior to implementing. (f) Prepare a complete reliability study and shall develop a reliability mathematical model including a reliability block diagram to apportion the reliability requirements and submit an analytical reliability study. (g) Develop a maintainability mathematical model including a supporting flock diagram to apportion maintainability requirements to predict design maintainability and to assess achieved maintainability. (h) Develop a Product Assurance Test Demonstration and Evaluation Plan. This plan shall provide for Test, Demonstration and Evaluation Program requirements for Reliability/Maintainability, Quality and Performance Assessment. It shall encompass detail requirements for a comprehensive test demonstration and evaluation plan and include: 																		
24. PACKAGING, PACKING, AND MARKING SHALL BE IN ACCORDANCE WITH:																		
25. DISTRIBUTION PATTERN:						BASIC FACT CODE:		STOCK NUMBER:										
DEPOT	DOC IDENT	RI FROM	M A S	U/I	QTY	CUST LOC NUMBER	S U P	SUPPL. ADDRESS	S I G	P A C	DIST	PROJ	PO	RDO	A D V	MGY DATA	UNIT PRICE	
UNIT PACK:			INTER PACK:			CONSIGNEE:												
P & P LEVEL:			PACKING LEVEL:			86												

CONTINUATION OR SUPPORTING SHEET <small>(AMCR 11-2)</small>	PAGE 2 OF 2 PAGES	DATE
	PRON	AMCHS CODE

- (1) Scheduled and detail description of test demonstration evaluation to be reported upon.
- (2) List of proposed reliability testing.
- (3) Requirement for various types and degrees of testing based on Reliability and Maintainability Math Models.
- (4) Furnish a Technical Data Package upon the completion of the Advanced development Phase compatible with MIL-STD-100, MIL-STD-490, MIL-D-1000 and MIL-S-83490.
 - (i) Frankford Arsenal will have responsibility for the rocket motor. Harry Diamond Laboratory will have responsibility for the ground sensor. A systems contractor will have responsibility for the entire system. Close coordination is required between the government agencies and systems contractor. NLABS will have overall responsibility.
 - (j) The choice of and design of the rocket motor shall be the responsibility of Frankford Arsenal. However, the design of the rocket motor shall be coordinated with the systems contractor.
 - (k) Design sketches or drawings of all breadboard components of the rocket motor and a description of how it operates as well as preliminary prototype design drawings of the rocket motor will be submitted to the systems contractor for written approval of its application to validate fitment, form and function with PRADS before they are finalized. Copies of all material sent to the systems contractor will be furnished to the Natick Laboratories Project Officer.

NOTE: The Advanced Development Phase will be a two year effort. This work order is for the Advance Development Phase for the first years effort as described in the above referenced document. The second years effort shall be authorized when those funds are available.

3. Reports Required: (a) Monthly Letter Progress Report – Five (5) copies are required by the 15th day of the month following the reporting period. These reports shall indicate progress made, special problems or events, conclusions, actions proposed for the next reporting period, percentage of work completed and percentage of costs incurred at the end of the reporting period. (b) Final Report – Four (4) copies of the Draft Final Report prepared in accordance with NLABS Reg. 70-16 shall be submitted for approval with 30 days after completion of the Advanced Development Phase. The Final Report shall include a complete documented analysis on safety, rocket motor temperature limits, storage shelf life, production costs, rocket motor re-use capability and reliability studies. One (1) reproducible and one collated copy of the Final Report shall be furnished within 30 days of NLABS approval of the Draft Final Report.